VOL. XV No. 4 APRIL 1930

MECCANO MAGAZINE

BUILDING WITH STEEL (see page 266)

Hobbies

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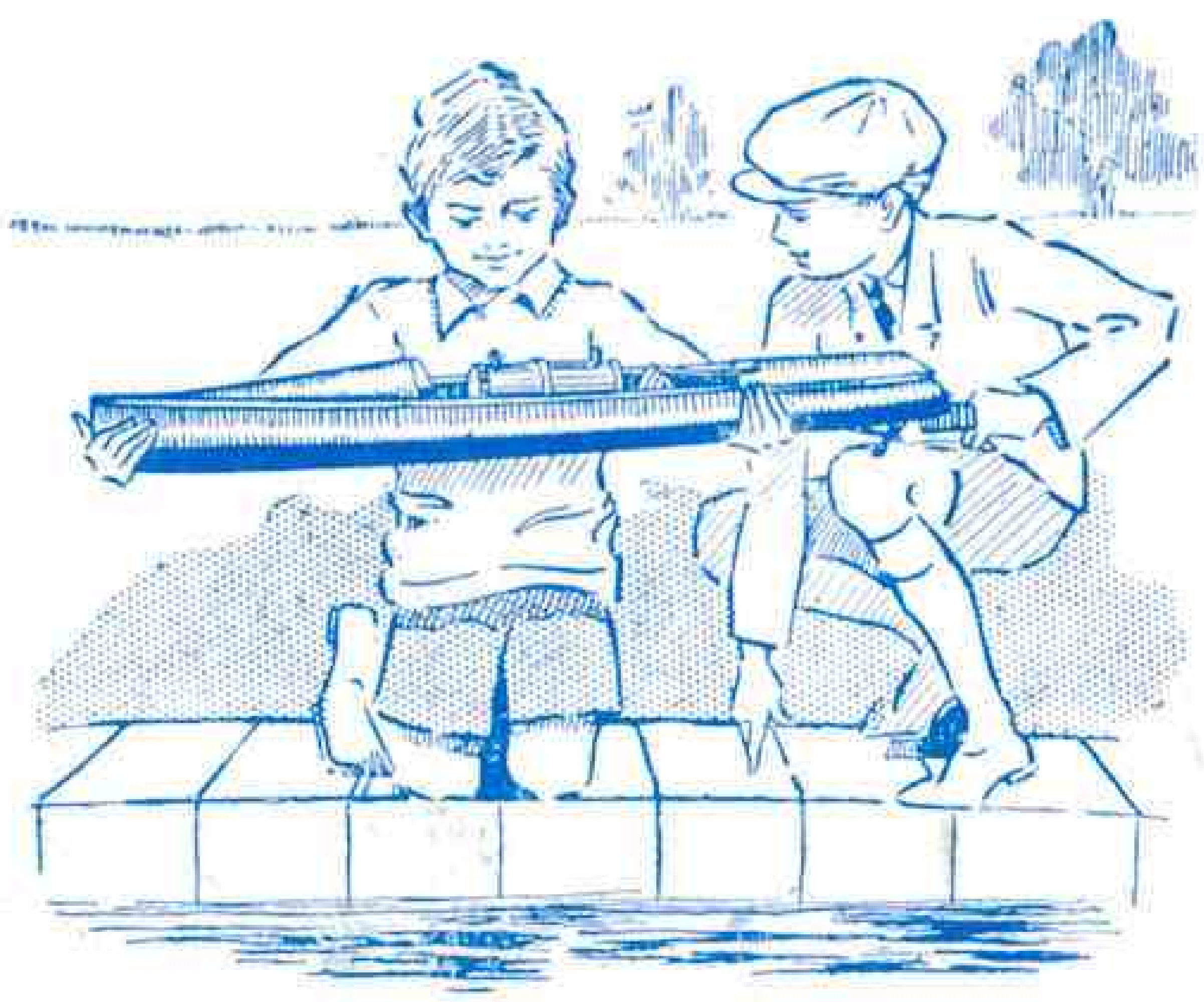

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NEXT MONTH: THE NAVIGATION OF SHIPS BY WIRELESS. PUBLISHED: 1st MAY

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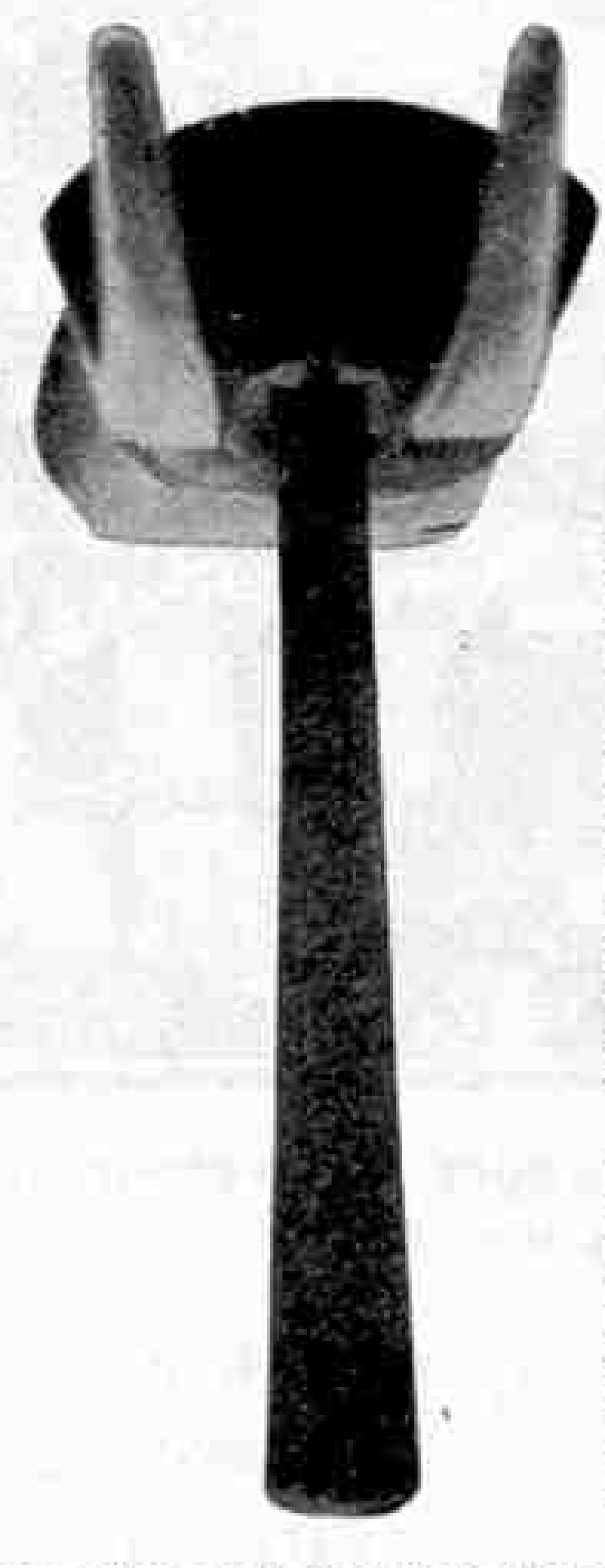
With the Editor

Mascots and Superstitions

When Sir Henry Segrave was about to start on his last attempt on the motor car speed record, a spectator threw a small live tortoise into the car. Presumably this was meant as an exhortation to the "*Golden Arrow*" and its driver to try to move a little faster than the notoriously slow-moving animal! The intention was good, or at least Sir Henry thought so, for he kept the tortoise in the car and proceeded to break the existing record by 24 miles per hour.

No. 17. WHAT EVER IS IT?



Here is the seventeenth of the popular mystery photographs that appear month by month in the "M.M." The ferocious aspect of the subject of this month's puzzle should not deter readers from efforts to trace its origin!

To the first reader who correctly identifies it or, if nobody is successful in this, to the one who gets nearest, I will send an autographed copy of my book "Engineering for Boys."

Solutions should be written on postcards only and addressed "Fditorial Competition, No. 17, Meccano Magazine, Old Swan, Liverpool." Post your entries to reach me before 30th April.

In spite of the great belief held by many people in the power of mascots I should scarcely advise owners of motor cars to adopt a tortoise, or to persuade a friend to throw one after them, in the hope of increasing the speed of their vehicles. Mascots of this kind only have a moral effect, and in any case, I scarcely think that Sir Henry needed any incentive of this kind to make him "step on the gas," as the Americans say!

To carry a mascot is merely a form of superstition, and from the extraordinary array of objects, both ornamental and amusing, that adorn the bonnets and the windows of many cars, it almost appears as if motorists are among the most superstitious of mortals. I myself have no faith in them and cannot remember having experienced any particular good luck from ownership of one—I have just as many punctures with them as without! Many of those who ascribe good fortune to the possession of a mascot probably forget to give it also the credit, or rather discredit, for their misfortunes. They would probably do better if they attributed any success they may have achieved to their own efforts.

But the craze for mascots has become so firmly fixed that many of us will continue to treasure black cats and carry lucky charms about with us; to avoid spilling salt, owning peacock feathers, walking under ladders or breaking mirrors.

I cannot see any reason why seven years' bad luck should follow breaking a mirror and even yet I am troubled when I think how difficult it must have been to be unlucky in the days before ladders were made and when mirrors had not been invented! Probably even prehistoric people had their mascots and superstitions, however, and in those far off days it was no doubt regarded as unlucky to walk under a mammoth or to meet the same sabre-toothed tiger twice in one day!

More "Mystery Ships"

The German liner "*Europa*," which early last year suffered severe damage from fire while being built, now has been completed and this summer will join the "*Bremen*" in the trans-atlantic service. Whether she will prove faster than her sister vessel is not known, but it is certain that between them the two will hold the Blue Riband of the Atlantic. It will be remembered that last summer the "*Bremen*" made the westward crossing in 4 days 14 hrs. 30 mins., and that the "*Mauretania*" failed in a wonderful effort to regain the laurels then lost to her younger rival, the German vessel retaining the record by a narrow margin.

I have previously suggested that the challenge thrown out by the construction of the German record-breaking vessels certainly would be accepted by British shipping companies. The plans that they have made to meet it have not been revealed, but both rumours and more reliable information suggest that the White Star Company intend to develop on its old lines of possessing the largest passenger liner afloat, and that the Cunard Company propose to build a vessel that will be speedier than the "*Bremen*."

It is well known that work actually was begun on a 60,000 ton vessel for the White Star Company, and although it was stopped later there is little doubt that it will be resumed. One of the most interesting features of this vessel, which in advance has been named the "*Oceanic*," will be the method of propulsion. It has been rumoured that the reason for suspension of work on her construction was that further consideration was to be given to the type of engines to be used. It is now believed that Diesel-electric propulsion will be installed and that more than 100,000 h.p. will be developed. Whatever decision may finally be made it is certain that the engines of the "*Oceanic*" will be of the standard usually associated with British marine engineering, which means that they will be the best that can be produced.

Less is known of the mystery Cunarder. It is said that more than once plans for this vessel have been made and scrapped because of the determination of the Company to build a worthy successor to the "*Mauretania*." According to the latest information available at the time of writing, a vessel capable in any weather of a speed of 30 knots is to be constructed. This will be a luxurious liner of giant size, and will cost about £6,000,000. Its construction will occupy about three years and it is rumoured that on its completion the Cunard Company intend to build a second ship that will be even speedier.

One problem that will receive special attention when the liners are built is that of making use of the full power developed by the engines. In order to do this the propellers must be very carefully designed and made, but the Cunard and the White Star Companies may be relied upon to see that there will not be any waste of the power developed by the magnificent engines they are planning.

Mystery Photograph No. 16

The majority of entrants in the March Competition seemed to sense immediately that they were confronted with something rather off the beaten track, probably very considerably magnified. They went warily, as a consequence, and very many of them succeeded in correctly tracing the source of the mystery to a highly magnified portion of an old style British half-crown, the exact section being at the centre of the top of the shield of arms.

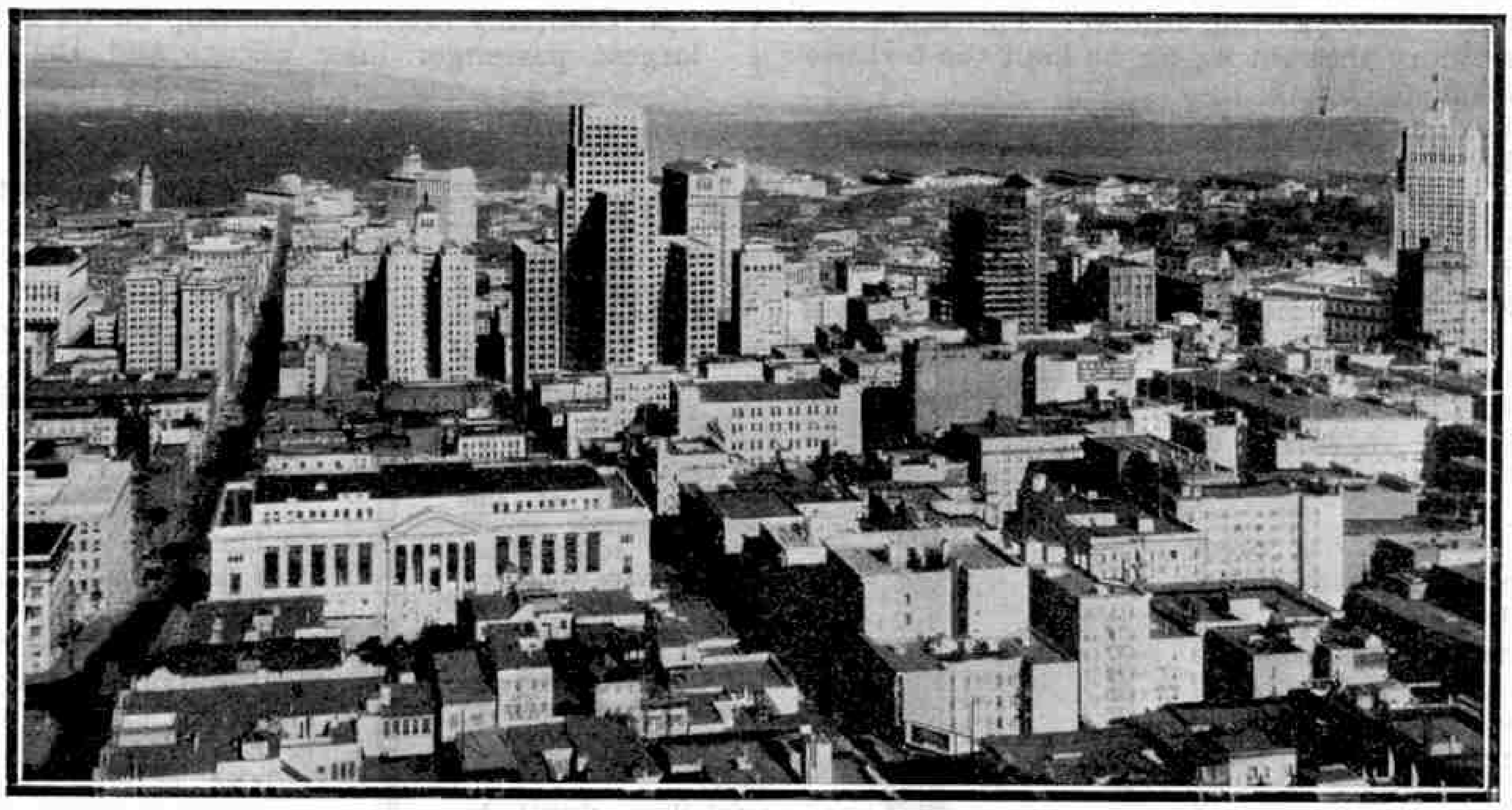
The first correct solution was from L. Todd, The Bungalow, Weybread, Harleston, Norfolk, to whom an autographed copy of my book "*Engineering for Boys*" has been sent. Consolation prizes are being sent to the 25 competitors whose entries came next.

Building With Steel

Modern Methods of High-Speed Construction

When man first turned his attention seriously to building, as distinct from such operations as adapting an existing cave to suit his individual requirements, the natural materials that he found ready to his hand were wood, stone and clay. Through the ages he gradually acquired skill in the use of these materials, particularly stone, until he was able to produce structures of enormous size and great beauty, which proved capable of enduring for thousands of years.

Centuries ago, stone, and the artificially-produced brick, were sufficient for all requirements. Great speed in building was not demanded and the engineers of the day had no hesitation in commencing the construction of buildings of enormous size because the labour required was so plentiful and cheap. Take for instance the building of the pyramids. The construction of such huge monuments would be no light one even to-day, with all the mechanical assistance at our disposal. Their building by the Egyptians was made possible only by the employment of tens of thousands of slaves working at top speed under threat of the lash. Modern conditions are utterly different, and it is impossible now to erect structures at high speed by sheer driving force of unlimited man power. Nevertheless speed in building has become more necessary year by year, and in addition types of structure have been evolved that could not be carried out in stone.



What the city of the future will be like. "Skyscraper" developments in the business quarters of San Francisco.

Whenever the modern architect or engineer requires a material that must have durability and great strength without great weight, he turns immediately to steel. This substance provides a material that is stronger than stone, infinitely more flexible and shapeable, and capable of being incorporated into a structure at a speed that cannot be approached by stone or brick. Steel is also a particularly accommodating substance in regard to its composition. Different structures and mechanisms call for different qualities in the material of which they are composed, and steel, by its readiness to combine with other substances, enables us to produce special alloys with a great variety of properties. The position is well summed up by Sir Robert A. Hadfield, Bt., in the following extract from his book "*Metallurgy and its Influence on Modern Progress*":—

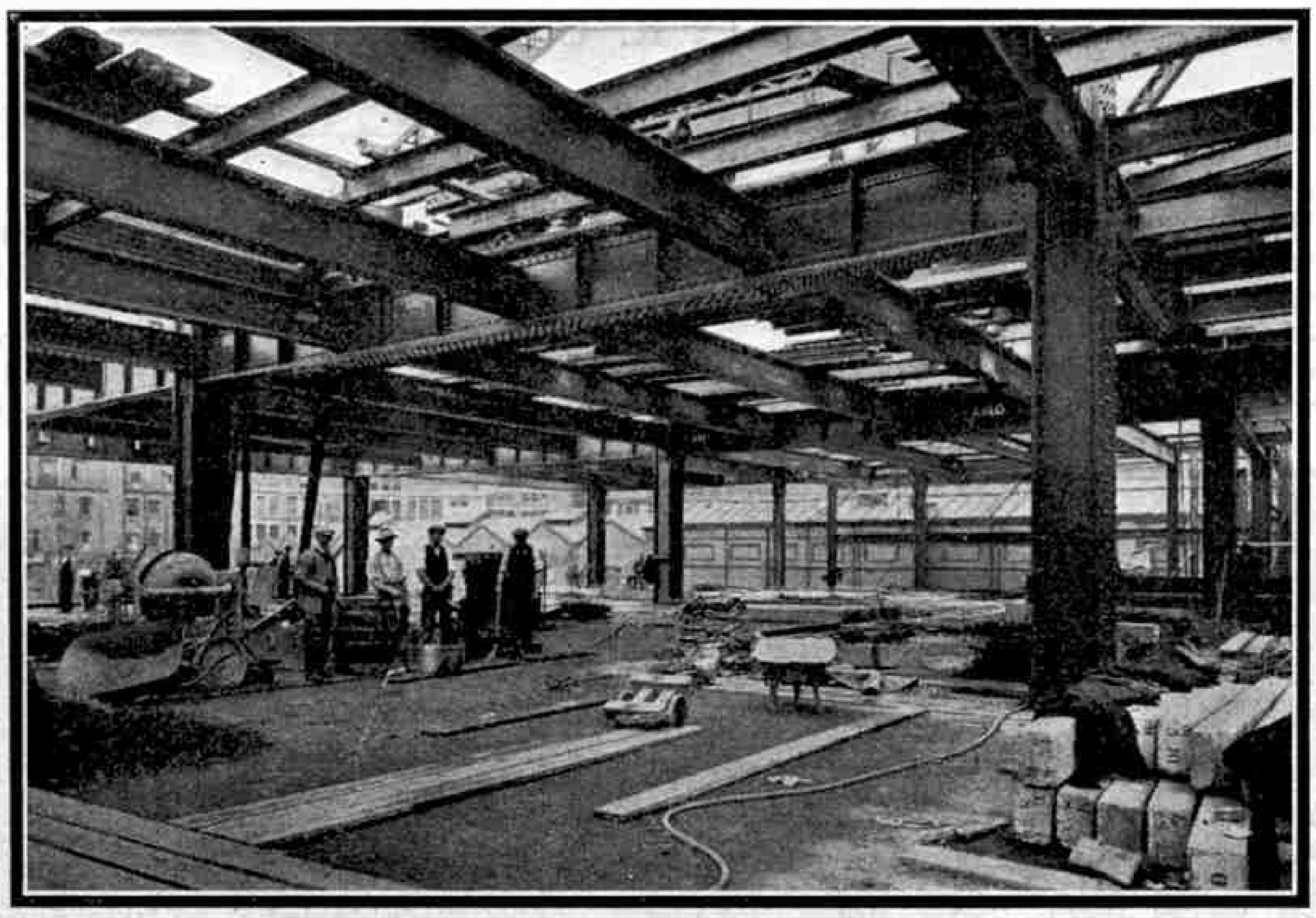
"The Iron Age, which merged into the Steel Age when Bessemer and Siemens discovered their processes for manufacturing steel, has since developed in the Era of Special Steels. Without iron we should inevitably revert to the impotence of the Dark Ages, and without alloy steels our fate would be little better, for iron and the simpler forms of steel will not give us, for example, the hard-wearing toughness of manganese steel; the wonderful energy-saving properties of silicon steel as used for electric generators, motors, and transformers; the greatly reduced rusting qualities of chromium and other steels; the special magnetic properties of tungsten and cobalt steels for permanent magnets and of manganese steel for applications where non-magnetic material is required. . . . ."

Perhaps the most striking example of the substitution of steel for stone and brick is to be found in the so-called "skyscrapers." These enormous structures depend for their strength upon a kind of steel cage running from top to bottom, and consisting of steel columns connected by horizontal steel girders. Steel frameworks of this kind are becoming more and more familiar in large towns, and their striking resemblance to gigantic Meccano models never fails to attract the attention of observers.

The feature about steel-frame buildings that strikes the onlooker most is the astonishing speed at which construction proceeds. Instead of the slow and steady progress from ground to roof that is characteristic of all buildings in stone or brick, the steel-frame building proceeds from many points at the same time. As soon as the steel framework has been erected, the floors and walls of each storey can be proceeded with at once, making use of the horizontal girders. This means that a greater number of men can be employed on the work.

Some remarkable feats in steel-frame construction are on record. For instance, the Murray Hill building, Madison Avenue, New York, which has 29 storeys, was completed to a height of 359 ft. in 81 working days, that is, 648 working hours! The great Paramount Theatre on Broadway, New York, which is the largest theatre in the world, was completed in less than a year. In this building 10,000 tons of steel were placed in position and made secure by 400,000 rivets.

A typical example of the steelwork in a large modern building is shown in the accompanying illustrations of the extension at Olympia, London. The accommodation of this famous building had become inadequate for the great exhibitions of to-day, and it was decided to build an extension that would almost double the existing floor space. Several unusual structural features are embodied in the design of the new building. As a rule exhibition buildings are designed on the principle of a ground floor and a gallery, but the new Olympia has four floors. The erection of the hall involved the use of more than 7,300 tons of structural steel. The main stanchions or pillars are composed of triple-section beams with wide flanges and strengthened by heavy flat plates riveted to the webs. Some of these beams weigh 26 tons each, and the necessity for their great strength will be appreciated when it is learned that in many instances they have to bear a direct load of 1,700 tons! The main girders are supported on tremendously strong concrete foundations, the girders themselves supporting in turn the smaller or secondary girders carrying the several floors.

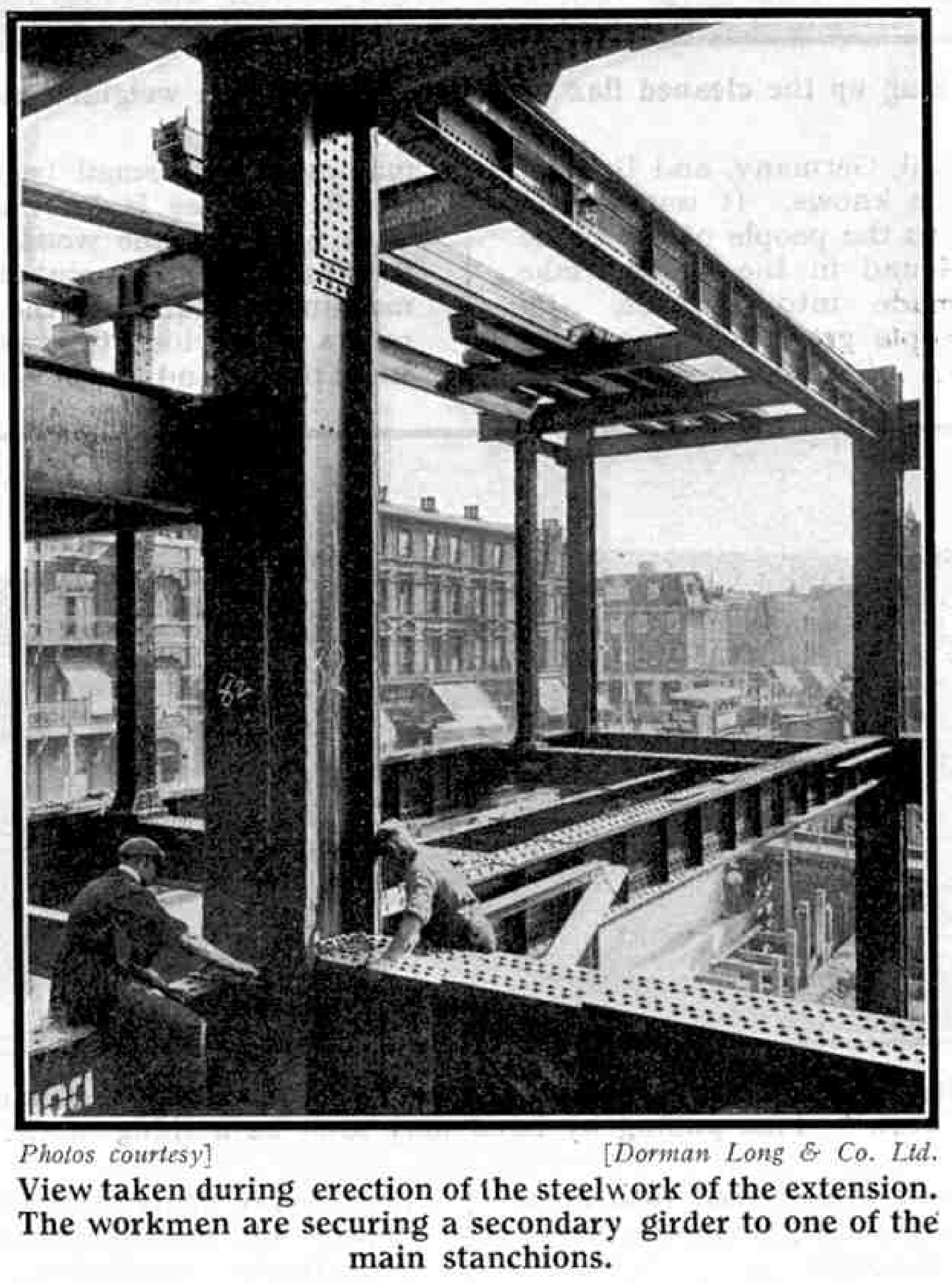


The immense stanchions forming the main supports for the four floors of the extension to Olympia, London. These great girders are designed to carry a load of over 1,700 tons.

It was particularly desired to have this extension completed sufficiently to be used for the British Industries Fair to be held in February last, and in this the builders were successful. The steelwork was erected at the rate of 500 tons per week, as compared with the customary rate of 100 tons per week. The maximum tonnage erected in one week was 680, which is about three times the previous record for this country.

The first step in the construction of a steel-frame building is the excavation for the foundation. Every type of building requires a secure foundation, but this is particularly the case with a skyscraper. The foundation has to support the steel columns that carry the whole weight of the building, and therefore it must be of an absolutely unyielding nature, solid rock for preference. When the foundation has been completed the steel cage rises gradually and is strengthened by a system of diagonal ties and braces. As each floor level is reached in turn, the completion of that floor is commenced and pushed on with great rapidity. Occasionally it has happened that upper storeys have been completed before those below, and it is a common occurrence for some of the storeys of a building to be ready for occupation before the roof of the building is anything like completed.

Among the many remarkable building feats accomplished in America is that of erecting a "skyscraper" on the top of an existing building, which was done in the construction of a new building at Hartford, Conn. The existing building was a thoroughly well-built structure, but it had not been designed to support the weight of a "skyscraper," and naturally was incapable of doing this. The necessary strength was secured by inserting through the heart of the building, from foundation to roof, four huge columns of poured concrete. A powerful cantilever truss was then laid upon the columns, and from it, as though supported on a bridge, was erected the new building.



Photos courtesy] [*Dorman Long & Co. Ltd.*

View taken during erection of the steelwork of the extension. The workmen are securing a secondary girder to one of the main stanchions.

As may be imagined, the building of these enormous steel-frame structures is not without danger. The preliminary calculations of the architects and engineers must be accurate to the minutest detail, and every stage of construction needs careful supervision. Much of the work can be done only by men of perfectly steady nerves and no tendency to dizziness. In spite of every precaution accidents do occur, but considering the amount of building that is carried on every day the freedom from serious mishaps is very remarkable.

For clothing the skeleton of steel-frame buildings enormous quantities of concrete are used. The earliest skyscrapers were designed with little or no thought to appearance, and many of them are undeniably ugly. The more recent structures, however, have an austere dignity that is very fascinating, and there are signs of the development of a new style of architecture that is by no means without beauty.

Next month we shall deal with the use of steel in bridge construction, and show how the engineer overcomes the many difficulties with which he is confronted.

The Making of Fine Linen

By C. R. Carter

LINEN is made from fibre of flax, a plant that is unique in the history of the world. It has been cultivated for the last 6,000 or 7,000 years, but even yet it has not been replaced by any other fibre; and recent events have shown that it is indispensable in times of war.

It is fascinating to trace back the history of linen to its earliest days. Xerxes twined it into rope to build a bridge across the Hellespont; the Romans used it for their first sails and traded it in remote parts of the world for precious stones, ivory, spices, and other treasures. Largely through her linen industry Egypt became the mistress of the world, her products being sent out far and wide wherever commercial intercourse existed. The Roman nobles had linen dyed with the purple dyes of Tyre, and hung it upon their walls; purple and fine linen thus becoming the symbol of aristocracy. Cæsar set the fashion in Imperial Rome in wearing linen robes, and by degrees the use of linen extended over all Italy and into Spain, Gaul, Germany, and Britain.

Scutchers making up the cleaned flax fibre into bundles each weighing about one stone.

When flax was first cultivated no one knows. It was certain that the uses of the plant were known to the people of the Stone Age, for rough or unworked flax is found in the ancient lake dwellings of Switzerland, carefully made into bundles. Of the manner in which these ancient people grew the plant and prepared it for use we have no means of knowing.

Many pages could be filled with the history and use of flax, but we must pass on now to modern times in order to learn something of the manner in which the world-famous linens of Ireland and Scotland attain their unsurpassed quality.

Those who have had the good fortune to see a field of flax in flower have seen one of Nature's most beautiful pictures. It seems almost incredible that in a few months' time these beautiful plants with their slender green stems and pretty blue blossoms will have been transformed into linen of dazzling whiteness. Before this is possible, however, many stages and processes must be passed through.

Pulling the ripe flax. When a good handful has been collected it is bound into a bundle or "beet." Flax pulling by hand may soon be a thing of the past.

The bright blue flowers soon change into little green balls containing seeds. At about the end of August the base of the plant commences to turn yellow; the leaves on the lower part of the stalk drop off, and the farmer then knows that the flax is ready for harvesting. In Ireland flax is pulled by the roots by hand, which is a very laborious and tedious process. Machines have been invented for doing this work, however, and there is no doubt that when these have been perfected pulling by hand will quickly become a thing of the past.

After the flax has been pulled it is tied into beets and sheaves and is ready for retting. Flax fibre is bound to the stem of the plant by a gummy substance, and the object is to dissolve out this gum by fermentation, so that the fibre may be easily stripped from the woody stem. In Ireland flax is retted by spreading it in earthen dams or ponds called "lint holes," which are full of stagnant water. The bundles of flax straw are packed into these, and mud and stones are placed on top, so that the flax is covered by about three inches of water. Fermentation soon sets in and the retting is finished in from seven to twelve days, according to the temperature and the kind of water that is used.

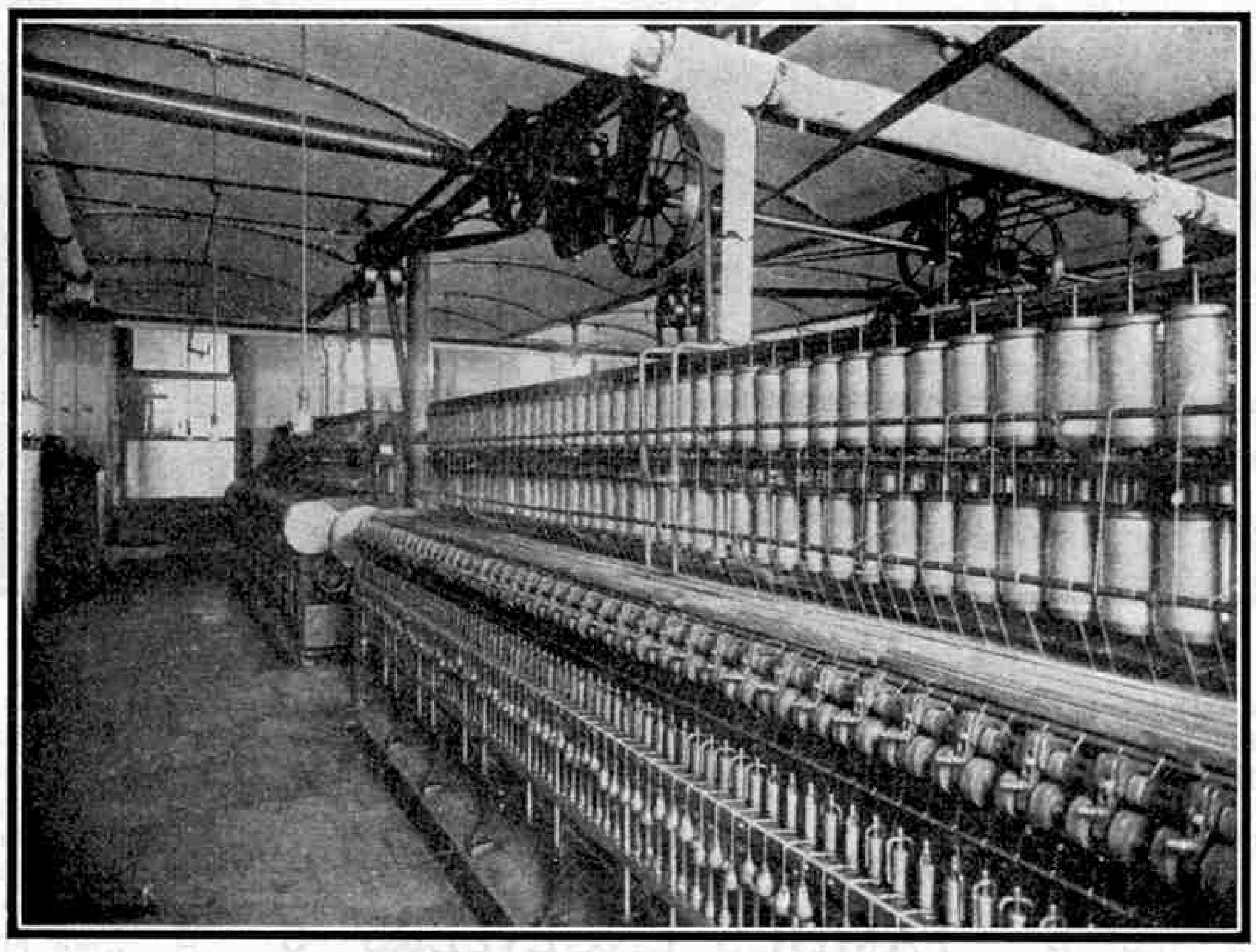
After retting the flax has to be dried, which is usually done in the open air, either by spreading it thinly upon the fields, or by making it into small beets. The next operation through which the flax passes is known as "scutching," the object of which is to break up the woody pith of the plant, and remove it from the fibres. Modern scutch mill machinery consists of a "butting" machine for squaring the ends of the stricks; a set of crushing rollers with which to crush the straw and break up the pith into small pieces, and finally a series of reversing blades called "beaters," which knock off the numerous small pieces of woody pith.

The scutcher usually makes up the handfuls of cleaned fibre into bundles weighing one stone. The flax is then sold, either at the scutching mill or at the market, and eventually it arrives at the spinning mill, where it is examined and then stored away until required.

In former days flax was spun by hand, and spinning was a widely-spread home industry. Hand spinning could not possibly keep pace with the present-day demand, however, and now all flax is spun by steam-driven or electrically-driven machinery. This machinery is exceedingly complicated, and while watching it at work it is difficult to realise that it is carrying out the same work that was done by the old-fashioned spinning wheel.

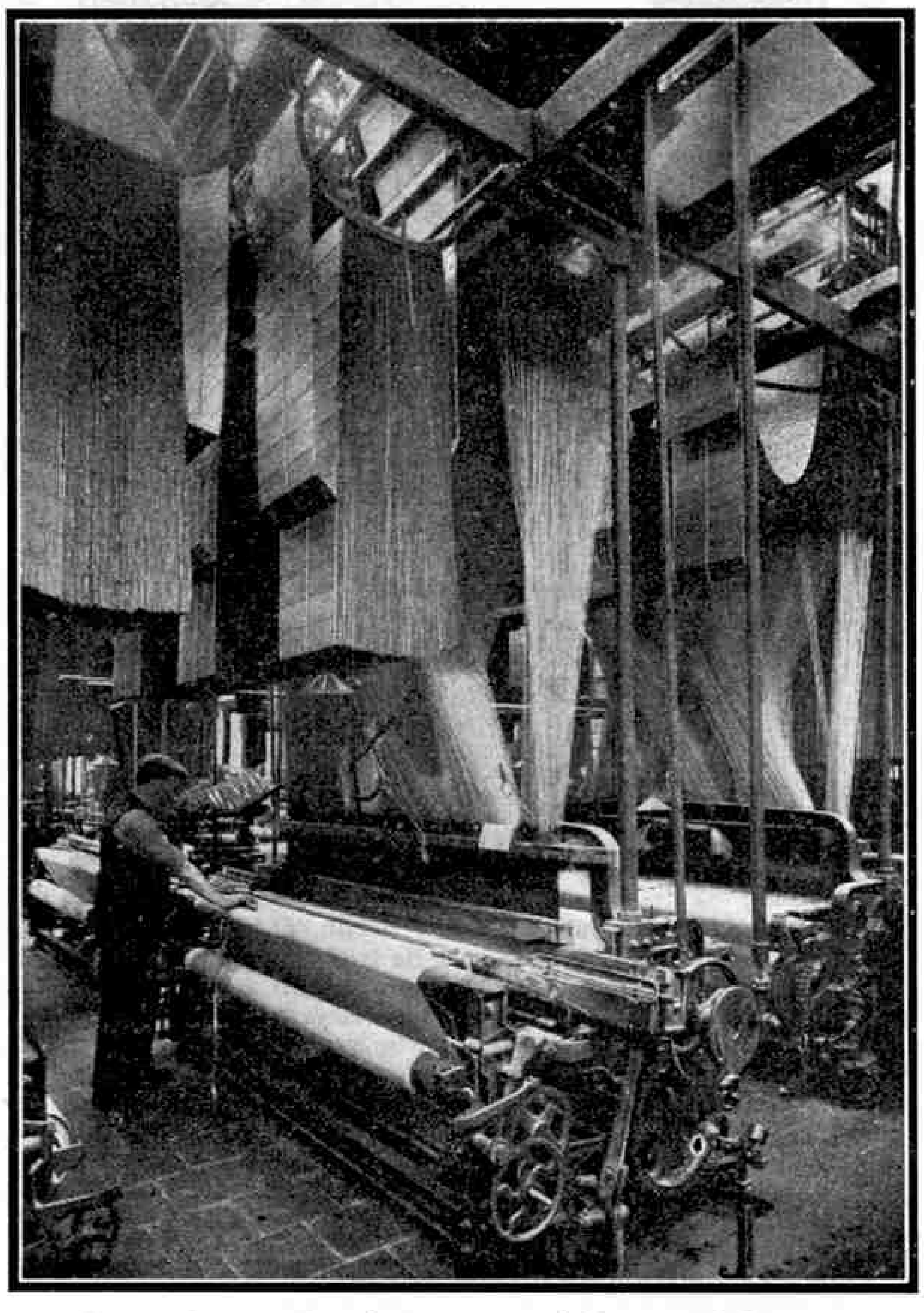
The modern spinner first sorts the flax into grades for spinning into various types of yarns. He then "roughs" and "hackles" it until it is like silk floss. The automatic hackling machine is one of the most beautiful pieces of mechanism in existence.

Hackling is a combing process, and the operation of the machine may be easily understood if one imagines a man holding up a bundle of flax in one hand while he combs it with the fingers of the other; subsequently reversing the piece, end for end, and again combing it. The automatic hackling machine carries out this process perfectly on a large scale. The short fibres that are combed out are set aside to spin into tow yarns for "crashes," or coarse strong linen. The yarn thus made is rather dirty, and one can see remaining in it little pieces of wood and straw.



Roving Frames in a Flax Spinning Mill. On these machines the flax thread is given a final twist into the form of thin tape as thick as knitting wool and wound upon hundreds of bobbins, ready for the spinning mill.

The hackled flax is spun into what are called "linen yarns," which are much cleaner and more even than tow yarns. To commence spinning the flax is first placed on a "spreader" or moving band composed of many finely spiked wheels, each wheel revolving faster than the preceding one. This draws out the flax into ribbons about three inches in width which, issuing from the drawing rollers, are doubled together under another roller and made into a thick endless ribbon of flax, which is collected in a can. This ribbon, which is called a "sliver," is then made finer and more even by passing it through a series of machines known as "drawing frames." These are very similar to the "spreader" just described, but are fed with slivers instead of loose flax or tow.



Damask weaving by means of Jacquard Looms.

After the sliver of flax has passed through these drawing frames it has still to be drawn out further, and in order to do this it must be given a slight twist and wound upon a bobbin. This is done by a machine known as a "roving frame," and when the flax has passed through this machine it is in the form of thin tape about the thickness of knitting wool, and wound upon a bobbin. The flax is now known as "rove," and it is ready for the spinning room.

There are two methods of spinning flax, the wet process and the dry. In Ireland flax is generally spun wet as it is in this manner that the finest yarns are produced. On the wet spinning frame the flax rove passes through a trough of hot water, which softens the gummy matter in it and enables the fibres to be drawn out and made into a fine yarn. Spinning changes the flax from the cord to a fine even thread, which leaves the spinning frame wound on bobbins, and is then prepared for weaving.

Linen, in common with other woven fabrics, is built up of two sets of threads known respectively as warp and weft, and the process of weaving consists in interlacing these upon a loom. The warp is arranged longitudinally while the weft crosses it at right-angles and passes under and over certain warp threads. The appearance and texture of the linen depend almost entirely upon the manner in which these numerous interlacings take place.

Weaving is of two kinds, plain weaving and damask weaving. Beautiful patterns are made in damask weaving by means of an ingenious arrangement called a "jacquard," which is fastened to the loom and makes a pattern by means of perforated cards, like the rolls in a player piano. This mechanism is named after its inventor, Joseph Marie Jacquard of Lyons, who obtained his patent in 1801. The Jacquard mechanism was intended primarily for use in silk weaving, but it has since been adapted, with equal success, in the weaving of linen and cotton fabrics.

Before it leaves the factory the linen is first looked over by a man known as a "cloth passer," who examines it with the minutest care in order to ensure that it is perfect in every respect. The linen is then run through a kind of double mowing machine called a "cropping machine," in which spiral knives shear away knots and loose threads from the surface of the cloth. It is then carefully examined a second time and if satisfactory is sent to the bleacher.

The object of bleaching is to remove all impurities and colouring matter from the cloth. A century ago bleaching could only be carried on in the long days between March and October. The linen was then boiled in lye and spread for days on the grass to be exposed to the effects of sun, air, and rain. Nowadays, by means of a mechanical process of boilings and washings, linen can be bleached all the year round and in a very much shorter time than formerly. Bleaching makes the cloth beautifully white, but it also makes it open and raw looking. In order to close it and give it a glossy surface it has to be "beetled" or "calendered," or both. The beetling engine, as used in Ulster, consists of wooden beams which, by falling continuously and rapidly upon the cloth give it a soft gloss and close up the threads. The object of calendering is to make the cloth still more glossy, and the machine that does this is really a huge mangle equipped with from four to six massive rollers.

Ireland and Scotland are famous for their printed linens. The object of printing is to impress a coloured pattern upon the cloth, and nowadays it is done by means of rollers, the old hand block method having been almost entirely abandoned. The pattern is cut out of copper rollers, and as many as six or eight colours can be put on in one operation upon the printing machines, each colour requiring a separate roller. Printing in one uniform colour is called "padding." Various other operations are necessary before the cloth is finally ready to be washed, starched, dried, and finished, either by beetles or by calender.

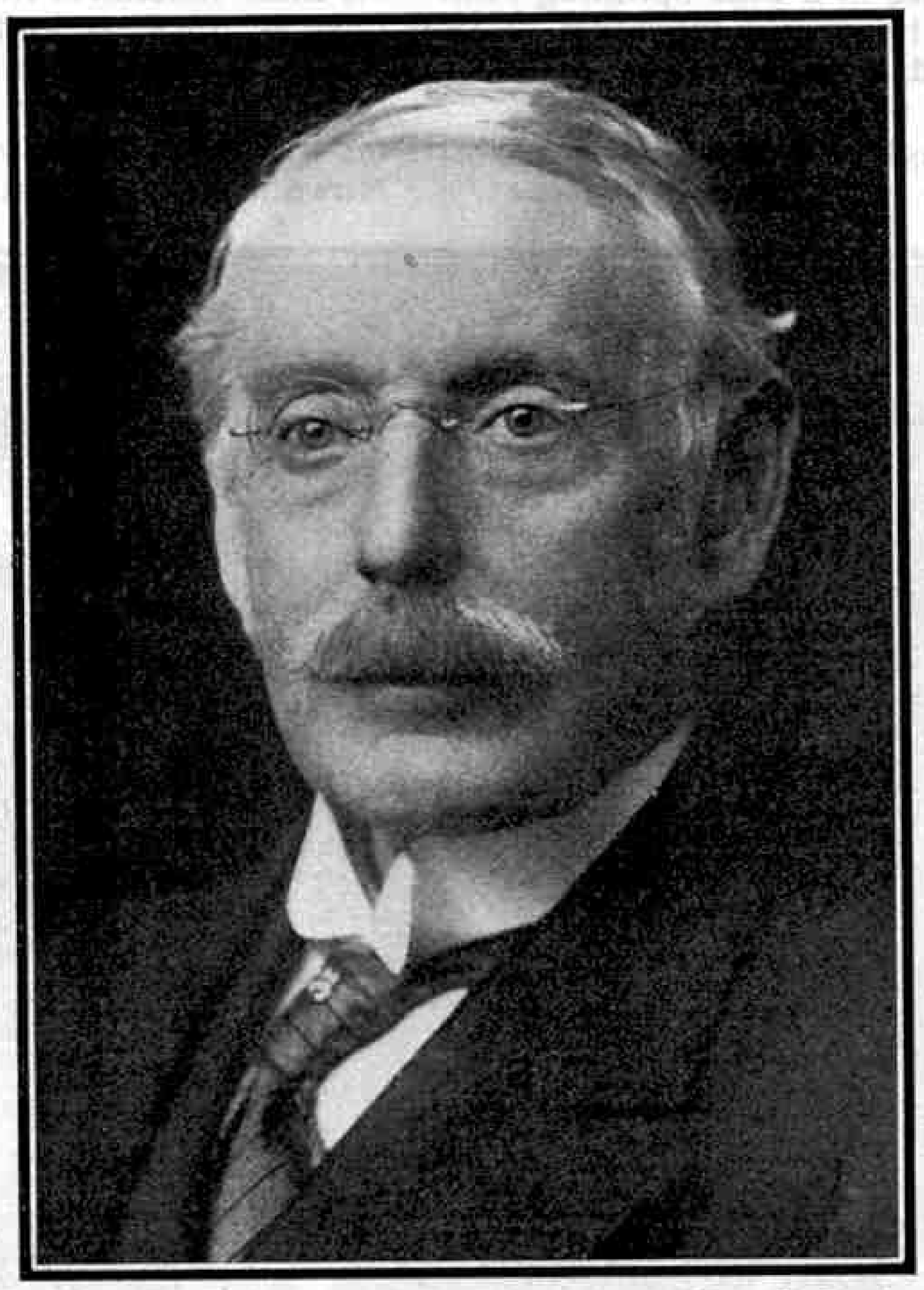
After being finished the cloth passes to the warehouse where it is carefully inspected and any defects are remedied. Cloth for handkerchiefs, centre pieces, table covers, etc., is turned into the correct size and hemstitched, thread-drawn, embroidered, or ornamented. Subsequently the cloth is lapped and made up to suit the special taste of the market for which it is intended. Finally it is squeezed in a hydraulic packing press and carefully packed in wooden cases.

WHAT SHALL I BE ?

VI.—MARINE ENGINEERING

CONTINUING our series of articles on the various branches of engineering as careers for boys, we now come to marine engineering. To a healthy mechanically-minded boy this offers excellent prospects, and it also is one in which the very best qualities of youth are developed. On the shoulders of the engineering staff of any vessel, whether it is a great Atlantic liner or a small coasting steamer, rests the responsibility of keeping in good order the engines on which the lives of the whole ship's company may depend. A boy who becomes a marine engineer, therefore, necessarily must be skilful and self-reliant, and he learns to be ready to tackle the most difficult tasks and to carry them out with whatever resources may be available.

FAMOUS ENGINEERS—6



Photo] [Russell, London

Sir Chas. A. Parsons, O.M., K.C.B., D.Sc., F.R.S., an engineer of world-wide fame. He is the son of the Earl of Rosse, a distinguished astronomer who built a famous giant reflector that at the time was the largest telescope in the world. At Cambridge University he became Senior Wrangler and afterwards devoted himself to engineering, in which he effected a revolution by the invention in 1884 of the reaction steam turbine. This type of engine came into general use in generating stations, and has been largely adopted for the propulsion of steamships. Sir Charles has twice been elected President of the British Association.

For those who are in a position to adopt it, by far the best course to take in order to become a marine engineer in the fullest sense of the word is to enter a University in which the Engineering Department pays special attention to this branch. The degree of such an institution is the best possible evidence of a sound training in engineering principles. Practical experience also is essential, of course, and this may be obtained by taking up an apprenticeship with a firm of marine engineers. Such an apprenticeship may be served on the completion of the University course, or the two may be combined into what is usually called a "sandwich" course. In this, alternative periods for a term of five years are spent in the shops and in attendance at University classes.

In order that a boy who is unable to attend courses at a University or Technical College may become a sea-going engineer he should spend a period of five years as an apprentice. For this purpose it is best to enter the works of a firm engaged in the construction of marine engines and boilers. This is not absolutely essential, however, and the necessary training may be obtained in an ordinary mechanical engineering works, provided that it is followed by practical experience with a firm of marine engineers.

As is the case with the training of mechanical engineers, two grades of apprentices are employed in the marine engineering industry. These are known as trade and technical apprentices. The former commence their training when they are between 14 and 16 years of age, and they are indentured for a period of five years. On entering the works they usually select one trade in which to specialise, but some firms now allow them to work in various shops and thus to gain wider experience.

Technical apprentices are recruited from the ranks of public or secondary school boys. Thus they have received a better education than the average trade apprentice, and they commence work when they are from 16 to 18 years old. In certain instances they pay premiums, which may be as high as £250, but this practice is gradually being abandoned. In the works they pass through practically all departments and also are given an opportunity of obtaining a working knowledge of drawing office methods and practice.

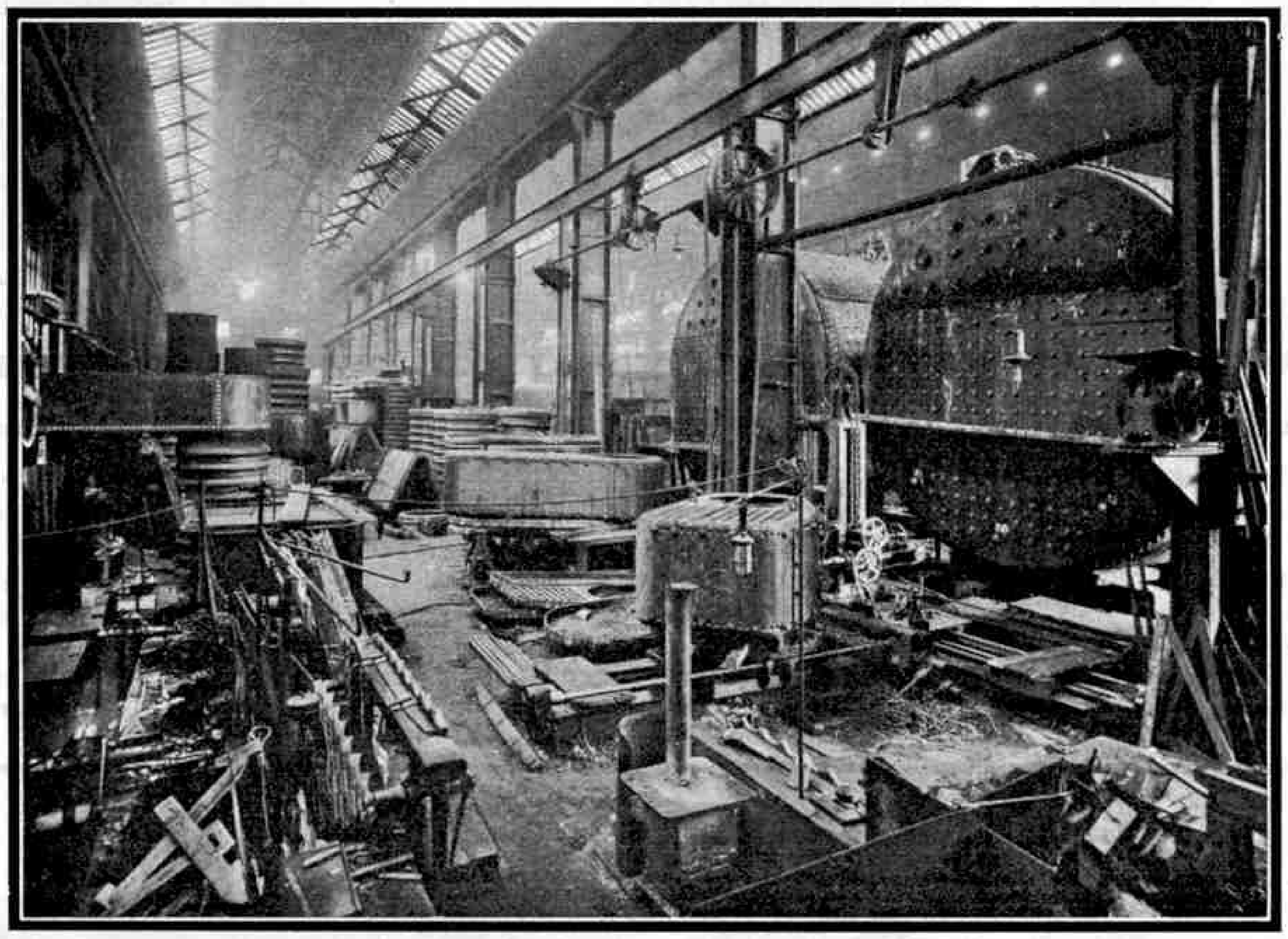
It will be seen that the training of a technical apprentice is far more comprehensive than that of a trade apprentice. That of the latter fits him only for employment as a skilled artisan, but a technical apprentice may rise to the higher positions on the constructional and operating sides of the industry.

Apprentices are required to attend classes at Technical Schools or similar recognised institutions, and if possible to obtain a National Certificate in engineering. In this way the technical apprentice may to a certain extent overcome the handicap of lack of University training, and the practice of attending courses of this description has the further advantage that the time so spent is allowed to count in place of sea-going experience.

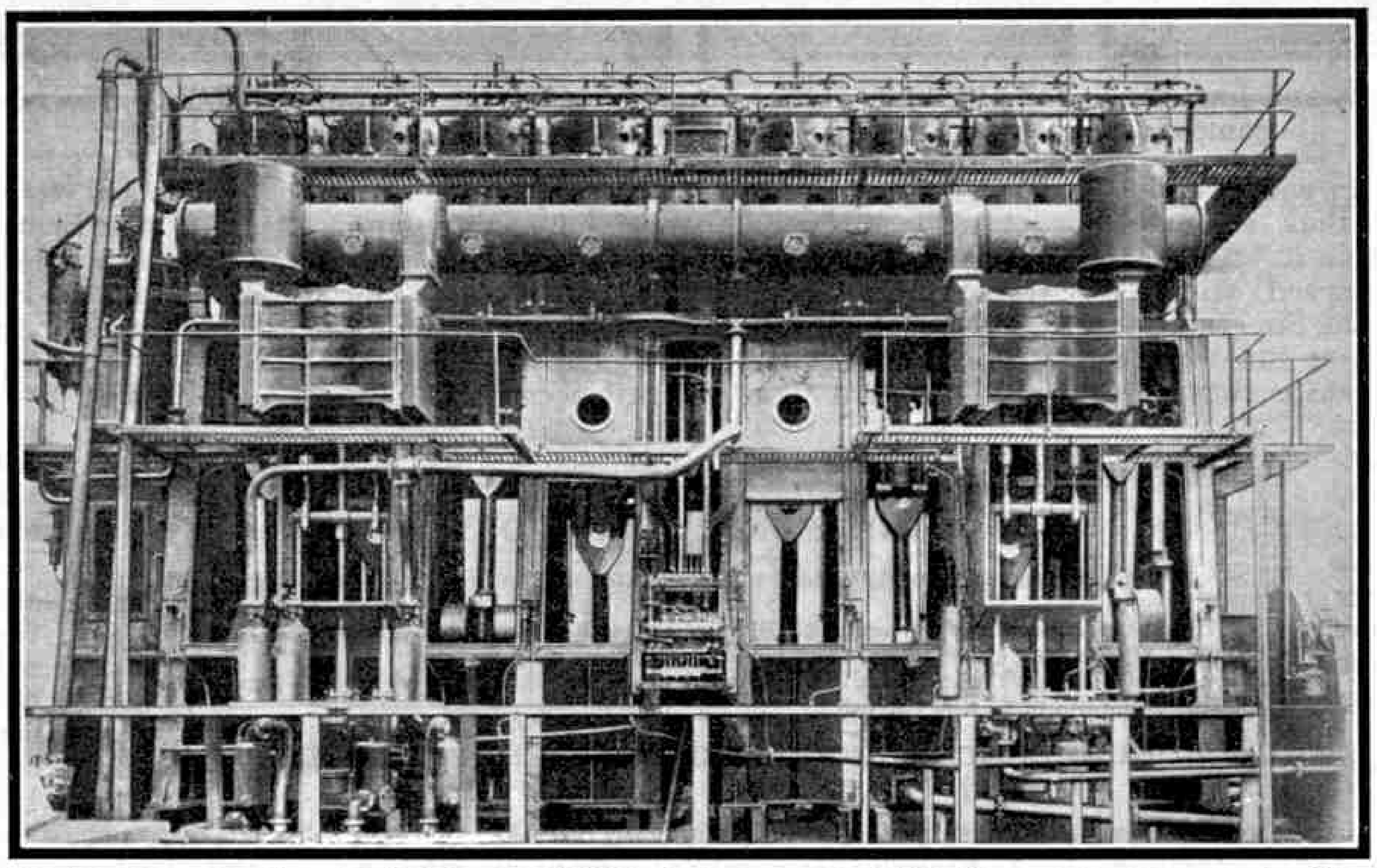
The wages paid to apprentices vary in different parts of the country, but in no case are they sufficient to make a youth entirely independent of his parents or guardians. Generally speaking, they are about the same as those paid to apprentices in mechanical engineering works, a boy of 16 years of age receiving from 7/6 to 10/- per week. This rises by small annual increments and during the final year is from 25/- to 30/- weekly.

At the conclusion of his term of service an apprentice usually seeks experience at sea. He does this even if it is his intention to take up a shore appointment, such as a post on the technical or designing staff of a firm of marine engineers, for experience afloat is of the greatest value, and even may be regarded as indispensable to those engaged in the production of marine engines and boilers. In each case the first step is to make application to shipping firms for a post as assistant engineer. Promotion from the lowest grade to the higher ranks depends on ability to secure the Second and First Class Certificates of competency that are issued by the Board of Trade. In order to obtain the first of these a youth must wait until he reaches the age of 21 and has served for a period of 18 months in a foreign-going steamer, or a longer period in one engaged in coastal waters. During this time the aspirant must have regular charge of an engine room watch. When in possession of these qualifications he is entitled to sit for the examination held by the Board of Trade for the Second Class Certificate. The First Class Engineer's Certificate may be taken after spending a further period of 18 months at sea.

The Board of Trade Certificates are not only a mark of knowledge and competence, but are absolutely essential to one who hopes to follow a career at sea. Every young marine engineer must aim at securing them and will be well advised also to take the examination for the Extra-Chief's Certificate, for this is the highest that may be obtained. Its holder may be regarded as a fully qualified marine engineer, for he has served a lengthy period at sea, thus gaining the necessary practical knowledge to cope with situations of all kinds, and has passed in turn three official examinations of high standard.


A view in the boiler shop of the marine engineering works of Swan Hunter & Wigham Richardson Ltd., Wallsend-on-Tyne. On the right may be seen two finished boilers.

It should be borne in mind that the possession of one of these Certificates does not necessarily mean that its holder will immediately secure a position in the grade for which it is a qualification. He may have to serve for a considerable time as third or fourth engineer before suitable vacancies in the higher posts arise. Naturally promotion depends on seniority as well as ability, but in this, as in any other career, hard work and skill eventually will lead to a good post. In the meantime valuable experience is being gained, and the organisation of the engineering staffs of sea-going vessels usually is such that the second, third and fourth engineers learn to take a full measure of responsibility for smooth working in the engine rooms of their ships.


" Neptune " marine oil engine that develops 3,200 brake horse power at 92 to 95 revolutions per minute. This is built by Swan Hunter & Wigham Richardson Ltd., to whom we are indebted for the illustrations on this page.

In addition to having charge of the propelling machinery the engineers of modern vessels look after auxiliary machinery that includes pumps, electric generators and motors in addition to refrigerating, heating and ventilation plant. The work thus involves a knowledge of practically all branches of engineering and in particular calls for acquaintance with oil engines. The internal combustion engine is becoming increasingly important in the shipping world, for in recent years there has been a very large increase in the number of motor ships constructed and the marine engineer of the future undoubtedly must be well acquainted with the construction and operation of Diesel and other types of oil engines both for auxiliary services and for propulsion.

The pay of sea-going engineers varies considerably. The Chief Engineer of a first-class passenger ship may receive as much as from £600 to £1,000 a year. In smaller passenger steamers and cargo vessels the rates are considerably lower, and the salaries of the Chief Engineers of such vessels range from £250 to £600 a year. Engineer officers of lower rank receive pay in proportion to these amounts. A junior engineer makes from £11 to £12 a month, a third engineer from £13 to £17, while a second engineer may receive from £18 to £25 monthly. It is interesting to find that the pay of engineers in the higher positions of motor vessels is greater than that of engineers in a steamship of the same size.

Prospects in marine engineering are quite good. At present there is a shortage of sea-going engineers both in steamships and in motor vessels, and a fully qualified and competent engineer has every opportunity of climbing to posts of importance and responsibility. The chances of doing this are perhaps greater for those engaged in motor vessels, for these are of comparatively recent introduction, and at the present time the branch of marine engineering concerned is not so crowded as the older one.

The majority of marine engineers find employment at sea, but it also must be remembered that a number of shore appointments are open to those who have a good record of service afloat. These include well-remunerated positions as surveyors under the Board of Trade or the large marine insurance companies. In addition, posts may be obtained under various Dock and Harbour authorities, while firms of salvage engineers also require surveyors. These appointments usually are filled by sea-going engineers, whose experience has specially fitted them to deal with the problems that arise. Situations of this character become vacant infrequently and it is necessary to be in possession of high qualifications in order to secure one of them.

As is the case with other branches of engineering an organisation exists for the purpose of looking after the interests of marine engineers. It is called the Institute of Marine Engineers, and membership of various grades is open to those who have passed the Board of Trade examinations, or are engaged in responsible constructional work ashore. In addition to members, associates and graduates are elected. For the second of these grades apprentices are eligible, and they become associates on the completion of their term of service. Full details of the Institute may be obtained by those interested on application to the Secretary, the Institute of Marine Engineers, 85/8, Minories, London, E.1.

Engines of World's Fastest Seaplanes

The Air Ministry have now given permission for the publication of brief details of the Rolls-Royce "R" type aero engine. Readers will remember that this type was fitted in the Supermarine "S6" seaplane piloted by Flg Off. H. R. D. Waghorn, the winner of the Schneider Trophy in September, 1929. A few days later Sq. Ldr. A. H. Orlebar established the world's speed record of 357.7 m.p.h. in the same machine.

This wonderful engine develops over 1,900 horse power, and weighs only 1,530 lb., so that the power-weight ratio is less than 1 lb. per horse power. The actual figure is .805 lb. per horse power. The engine has been developed from the Rolls-Royce "F" and "H" type engines. It is only 50 in. in length and 30 in. in width, and it seems almost incredible that so much power may be obtained from it.

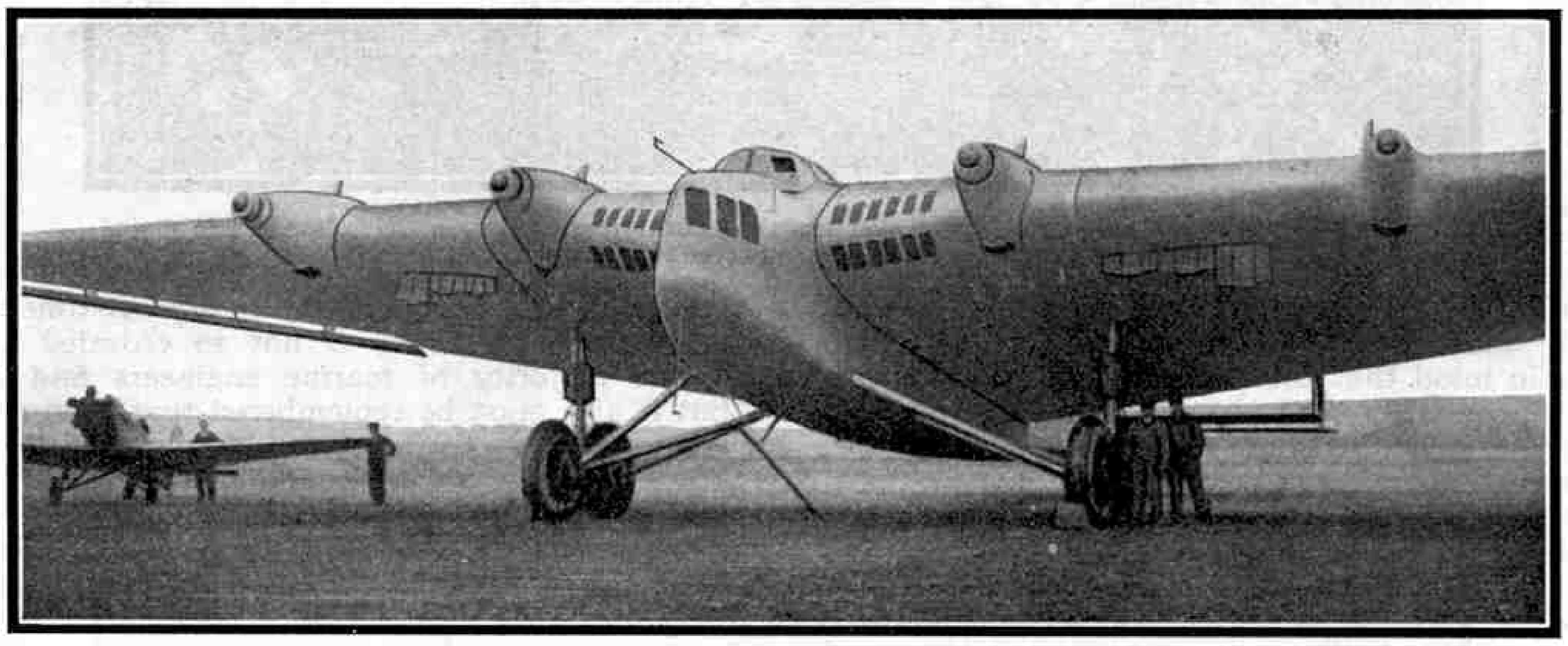
Although the amazing speed of 357.7 m.p.h. was attained when the Supermarine seaplane made an attack on the world's record, Rolls-Royce Ltd. state that this wonderful engine was not run under the best conditions. The makers claim that the airscrew used on this occasion was incapable of absorbing the full power of the engine, and that had this been really utilised even higher speeds could have been obtained.

It is understood that the Supermarine-Rolls "S6" seaplane is shortly to be used in further high speed flights, when more startling results are expected.

Details also are now available of the Napier engine fitted in the Gloster VI machine in which Flt. Lieut. G. H. Stainforth set up a world's speed record of 336 m.p.h., which was surpassed shortly afterwards by that of Sq. Ldr. Orlebar. The Napier engine is only 1,130 lb. in weight, and normally develops 1,275 h.p., giving a power weight ratio of .886 lb. per horse power.

Light Aircraft Records

Three world's records for light aircraft have been set up recently. Two of them were secured by an Italian pilot, Commander Renato Donati, who flew a distance of about 1,865 miles in a closed circuit, remaining in the air for about 30 hours. This flight established records for distance flown in a closed circuit and for endurance.



Dignity and impudence ! A Junker's Junior, standing beneath one wing of "*G38*," the recently completed Junkers machine. The span of the giant monoplane is 154 ft.

Commander Donati was flying a Fiat "A.S.1" type two-seater aeroplane fitted with a Fiat "A.50" engine developing a normal output of 90 h.p. The weight of the aircraft on taking off at an aerodrome near Rome was about 2,315 lb.

The third light aircraft record was for altitude and was secured by M. Albert, a French aeronautical engineer, who is also a pilot. The aeroplane in which the attempt was made was of the single-seater type and in it M. Albert succeeded in attaining a height of 26,250 ft., thus breaking the previous world's altitude record of 25,000 ft. set up by a Beazley "N.B.3" monoplane equipped with an Armstrong-Siddeley "Genet" engine. Readers will probably remember that some time ago M. Albert set up a French altitude record for light aircraft of 21,255 ft.

THIS MONTH'S AIR STORY

Grandmother had finally yielded to the repeated urging of a grandson to accompany him on a flight.

"Do you realise that we are 17,500 feet above the ground ?" shouted the youthful pilot after a long climb.

"Oh I don't mind that," she replied bravely, "but it's very cold. Don't you think you ought to stop the fan ?"

Interesting Aviation Events of 1930

A number of interesting aviation events are to take place in England in the summer of this year, and an important decision that has been arrived at by the F.A.I. has added one more to the list. This is the inclusion of London and Bristol as stopping places in the annual "Challenge de Tourisme Internationale" round Europe that is to take place between 20th July and 7th August.

It is hoped that this year the Aerial Derby will be reinstated. If a sufficient number of entries are received this race will be held for the first time since 1923, and in that case it is expected that some exceedingly high speeds will be attained.

Another feature of interest in this year's race programme is that one day only will be allotted to the King's Cup Air Race round the British Isles, which in previous years has always occupied two days. The race is to be held on 5th July.

There will be two main air displays held this year, one being the annual R.A.F. Display at Hendon, and the other a Pageant in connection with the Centenary Celebrations of the Liverpool-Manchester Railway. The R.A.F. Display is to be given on 28th June, while the Liverpool Air Pageant will be held on 20th September at a new municipal aerodrome at present under construction at Speke, near Liverpool. The Pageant is being organised jointly by the Liverpool and District and the Lancashire Aero Clubs, and official sanction has been obtained for the appearance of a large number of R.A.F. machines.

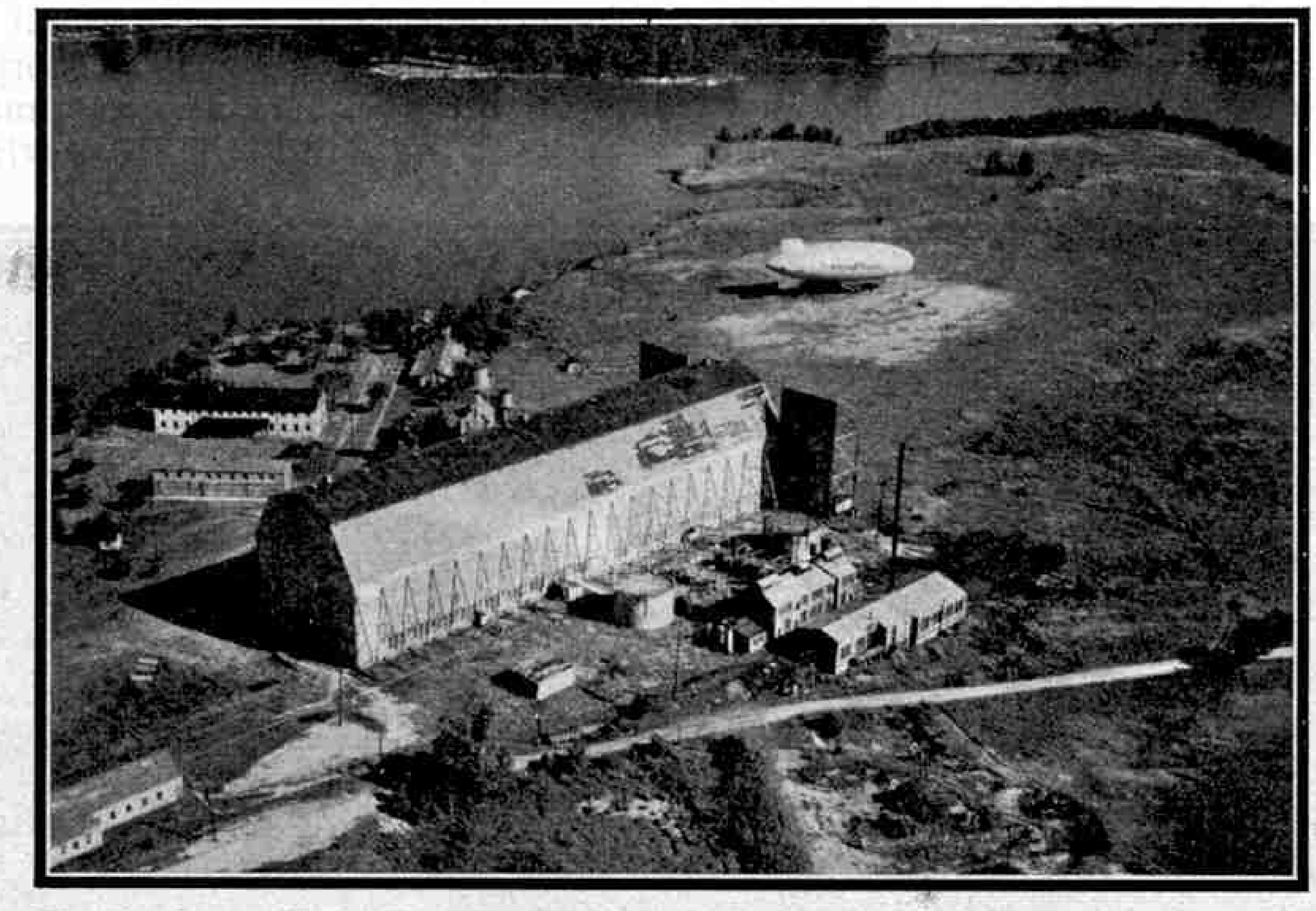
The Junkers "G38"

The Junkers "G38," a photograph of which is published on this page by the courtesy of Junkers-Flugzeugwerk A.-G. of Dessau, makes use of the wing to house passengers ! We hope shortly to publish a full description of this machine.

The Schneider Trophy Contest of 1931

At a meeting of the Féderation Aéronautique Internationale it was decided that the next Contest for the Schneider Maritime Trophy should take place between 1st June and 30th September, 1931. The exact date will be decided later and entries must be received on or before 31st July, 1930.

In aviation circles there has been much discussion concerning the Watertight and Navigability Tests, which are not regarded as serving any useful purpose. The Royal Aero Club therefore, suggested that they should be abandoned and proposed that for them Getting-off and Alighting Tests should be substituted. The Federation accepted this proposal, and also decided that in future all tests should be carried out on the day of the Contest itself in order to minimise danger of adverse weather conditions.



The Goodyear airship hangar at Wingfoot Lake, Ohio. The airship seen landing is the "*Defender*," the most recently constructed of the Goodyear fleet of "Blimps."

It is interesting to note that in preparation for this contest a High Speed Flight has already been formed in France. This is being run on similar lines to the British Flight that last year was stationed at Calshot. Sadi Lecointe and Lieut. Paillard, two of the most experienced of French high speed pilots, are members of the Flight, and it is equipped with the machines that were ordered for the Contest of 1929, but were not completed in time.

No active preparations for the Contest have yet been made in England, but it is stated that an anonymous offer to pay for the construction of two experimental machines has been made. In view of the Government decision not to enter an R.A.F. team, it is expected that this offer will be accepted by the Royal Aero Club.

New German Airship Planned

The exploits of the German airship "*Graf Zeppelin*" and the completion of the British vessels "*R.100*" and "*R.101*" aroused great interest in buoyant aircraft, and this will be further stimulated by the completion in America of the large naval airships now being constructed by the Goodyear Company for the American Navy. It has now been announced that a sister ship to the "*Graf Zeppelin*" is to be built by the Zeppelin Airship Company. It will be called "*L.Z.128*" and will be ready for trials during the summer of 1931.

The proposed German vessel is to be 740 ft. in length. Thus it will be 31 ft. longer than "*R.100*," but 60 ft. shorter than "*R.100*" will be when this British airship has been fitted with the extra gas bag to which reference was made in these notes last month. It is said that internal features and arrangements similar to those of the two British airships will be incorporated in "*L.Z.128*."

The American "*Z.R.S.-4*" will be ready before the "*L.Z.128*," as the contract calls for delivery in April 1931. Work is still steadily progressing on this airship, and the master ring and two intermediate rings of the skeleton are now almost completed. They are laid upon horizontal building forms for the convenience of the workmen and are to be raised to the perpendicular when completed.

New Safety Aeroplane Developed

A new type of aeroplane that is claimed to be one of the safest yet designed has been constructed by a well-known German Aircraft Company. The machine is equipped with a wing of unusual section, and it is claimed that this makes the aeroplane totally immune from any tendency to develop the dreaded "spin" when in a nose-dive, or when flying-speed has been lost and the machine stalls.

The machine, which has been constructed by the Focke-Wulf Aircraft Company, has accommodation for six people, including the pilot. It has a cruising speed of 95 m.p.h. and a maximum flying speed of 112 m.p.h. The initial climb to 3,000 ft. may be completed in six minutes. A striking proof of the popularity of British aero engines is afforded by the fact that the aeroplane is equipped with a "Bristol" Titan engine developing 230 h.p.

High Speed Trophy for England

A number of American aviation enthusiasts recently presented a trophy to the Féderation Aéronautique Internationale to be awarded to the country of any pilot who succeeds in establishing a new world's air-speed record. The "*L. S. Thompson Speed Trophy*," as it is called, has been awarded to England in recognition of the record of 357.723 m.p.h. set up on 12th September, 1929, by Sq. Ldr. A. H. Orlebar, and a replica of the trophy is to be presented to the pilot.

Air Mail Carries 40,000 Letters Weekly

The England-India Air Mail Service was established on 30th March, 1929, practically a year ago, and figures now available show how remarkably the popularity of this service has grown. During the first month in which it was operated the number of letters carried averaged 12,000 weekly. The number steadily increased and in December, 1929, the average weekly load was 40,000 letters. Nearly 25 tons of letter air mail were flown from England to India between the opening date and 31st December. When the service eventually is extended to Australia it is very probable that even more amazing figures will be recorded.

The Cost of Air Taxis

That civil aviation in Great Britain is making satisfactory progress is shown by the increasing amount of air taxi work that is being carried out. A business man who wishes to undertake a rapid journey by air may now ring up Imperial Airways at any time of the day or night and charter an aeroplane at a cost of 1/9 a mile.

For a machine to carry twenty passengers the charge is only 10/– a mile. Thus each passenger in such an aeroplane would pay only 6d. per mile, which is appreciably less than the cost of hiring an ordinary taxi. In addition there is no charge for waiting time if the aeroplane returns to Croydon not later than the day following departure.

An instance of the unusual tasks to which air taxi services may be put was given recently when a traveller bound for Marseilles and the East left behind him an important bunch of keys. The discovery was made by a servant, who immediately ordered an air taxi by telephone. Two hours after their owner left Victoria Station, a machine carrying the bunch of keys as the only cargo left Croydon for Paris, and they were handed to the traveller as he stepped from his train on arrival in the latter city.

In the northern part of England the air taxi services are run by Northern Air Lines, and, as mentioned in the "*Air News*" of our November 1929 issue, a machine to seat one passenger may be hired from this firm at a rate of 10d. per mile flown. For two or more passengers the charge is 9d. per mile.

Diesel Engines for Aircraft

Recently there have been rapid developments in the application of the Diesel engine to aircraft work, particularly in America. The Packard Company have already produced a Diesel engine that has been installed in various aeroplanes and on one occasion a machine fitted with one of these engines flew from Detroit to Indianapolis, a distance of 320 miles. During the flight only eight gallons of fuel were used, the cost of this being about 1/4.

Another American concern that is interested in the use of Diesel engines in aircraft is the Fairbanks-Morse Company. This firm manufactures Diesel engines for marine purposes and is now engaged on experimental work with an aero engine of similar type.

A British Diesel engine for installation in aircraft has been designed by Mr. Coatalen, the well-known engineer associated with the Sunbeam Motor Company Ltd. We hope shortly to publish full details of this engine.

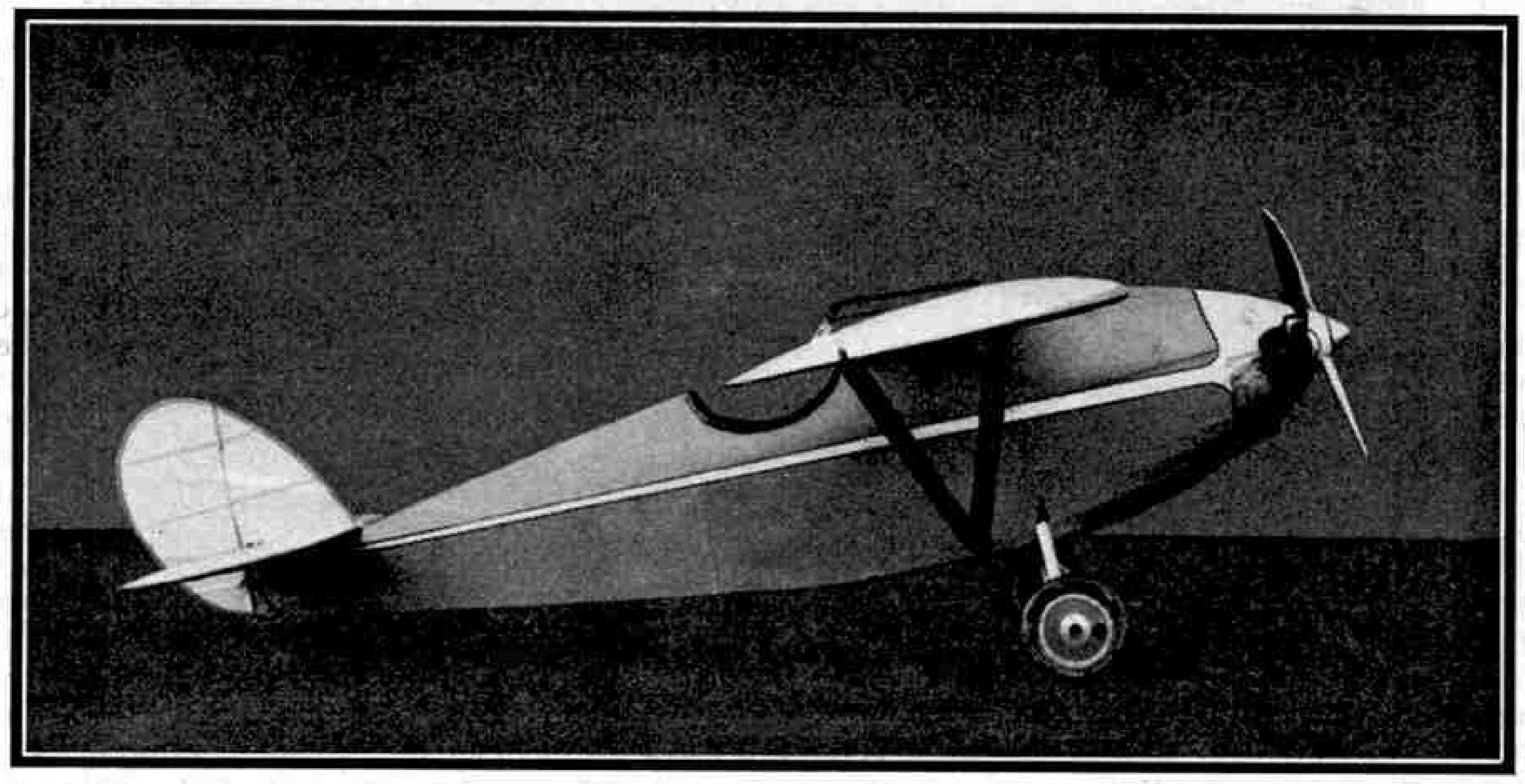
Suspension of London-Le Touquet Service

Imperial Airways have announced that their London-Le Touquet service has now been suspended as the surface of the aerodrome at Le Touquet is unsuitable for the use of heavy aircraft.

British Single-seater Light Aeroplanes

New Type of Machine for Civilian Aviation

Of the many types of aircraft now in regular production it is probable that none makes a greater appeal to popular imagination than the single-seater civilian machine. It is only comparatively recently that special attention has been given to the production of aeroplanes of this type, which have been described as the "motor cycles of the air," but these promise to become very popular. Their price is low and the cost of upkeep small. They are capable of excellent performance, however, and as they are very handy and have been designed with a view to making landings in fields smaller and rougher than the grounds of regular aerodromes, they are ideal machines for cross-country work.

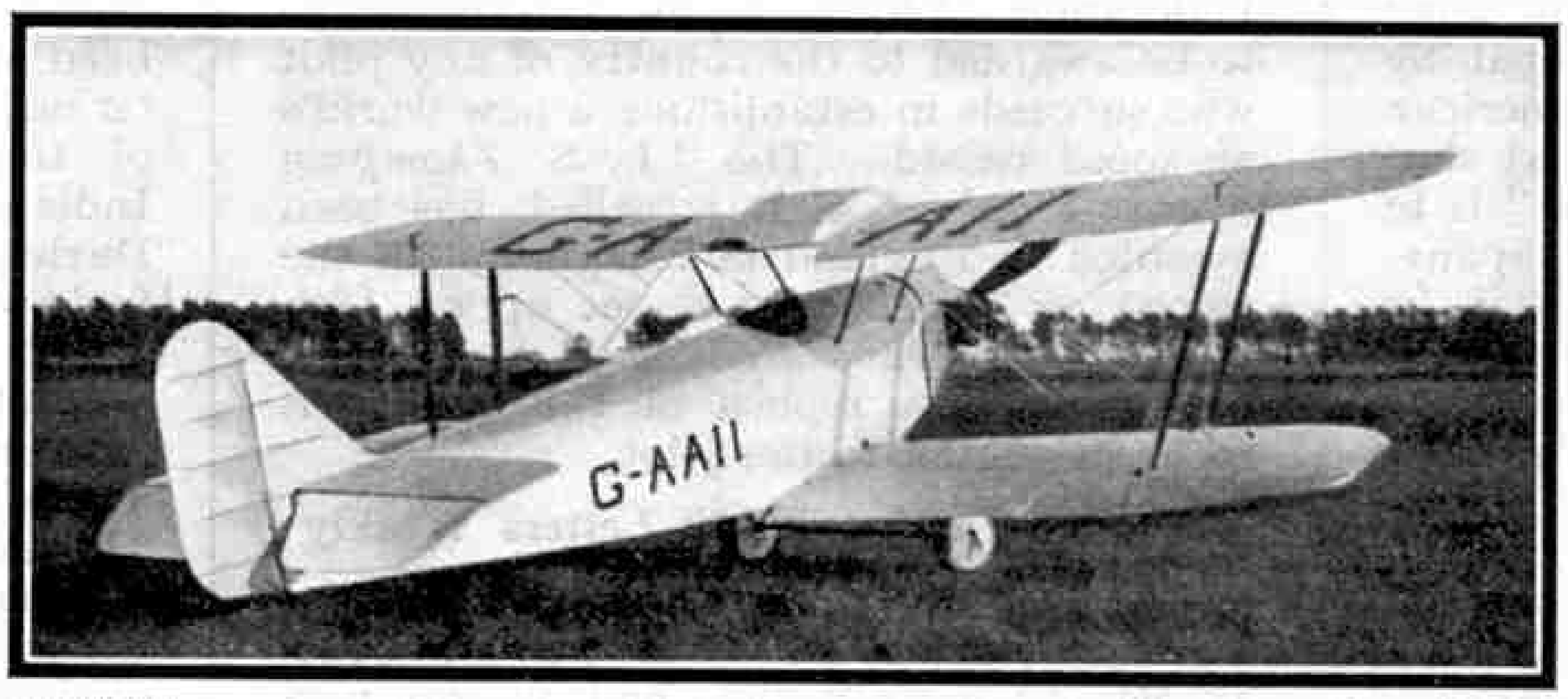


Courtesy] [*Comper Aircraft Co. Ltd.*

The Comper "Swift," a single-seater light aeroplane that is specially designed for sporting and touring work. This machine is an excellent example of efficient stream-lining.

Single-seater aircraft also are invaluable for aero club work, especially when a limited number of dual instruction machines are available, for in them novices may make their earlier solo flights, and thus leave training machines free for other purposes. Their low price also places these light aeroplanes within the reach of airmen of moderate means who wish to complete the specified number of flying hours to obtain their "B" or commercial license.

At the present time only four single-seater light aeroplanes are produced by British firms. These are the "Robin," designed by A.B.C. Motors Ltd., and constructed under license by Saunders-Roe Ltd., of East Cowes, Isle of Wight; the Comper "Swift," built by the Comper Aircraft Co. Ltd., Hooton Park Aerodrome, Cheshire, the home of the Liverpool Aero Club; the Southern "Martlet," the product of Southern Aircraft Ltd., Shoreham Aerodrome, Sussex; and the "Gadfly," of Glenny and Henderson Ltd., Byfleet, Surrey.



Courtesy] [*Southern Aircraft Ltd.*

Rear view of the Southern "Martlet," the only biplane among British single-seater light aeroplanes.

Three of these machines are monoplanes, the Southern "Martlet" being the only biplane. They are very reasonable in price, the "Robin" and the Comper "Swift" costing £395 and £400 respectively, while the price of the Southern "Martlet" is £550. The last-named aeroplane is fitted with a 75 h.p. "Hornet," an engine of higher power than is employed in the remaining three machines, all of which are equipped with the 35-40 h.p. "Scorpion." The "Hornet" and the "Scorpion" are manufactured by A.B.C. Motors Ltd., and it is interesting to find that this firm manufactures the engines with which all British single-seater light aeroplanes are fitted.

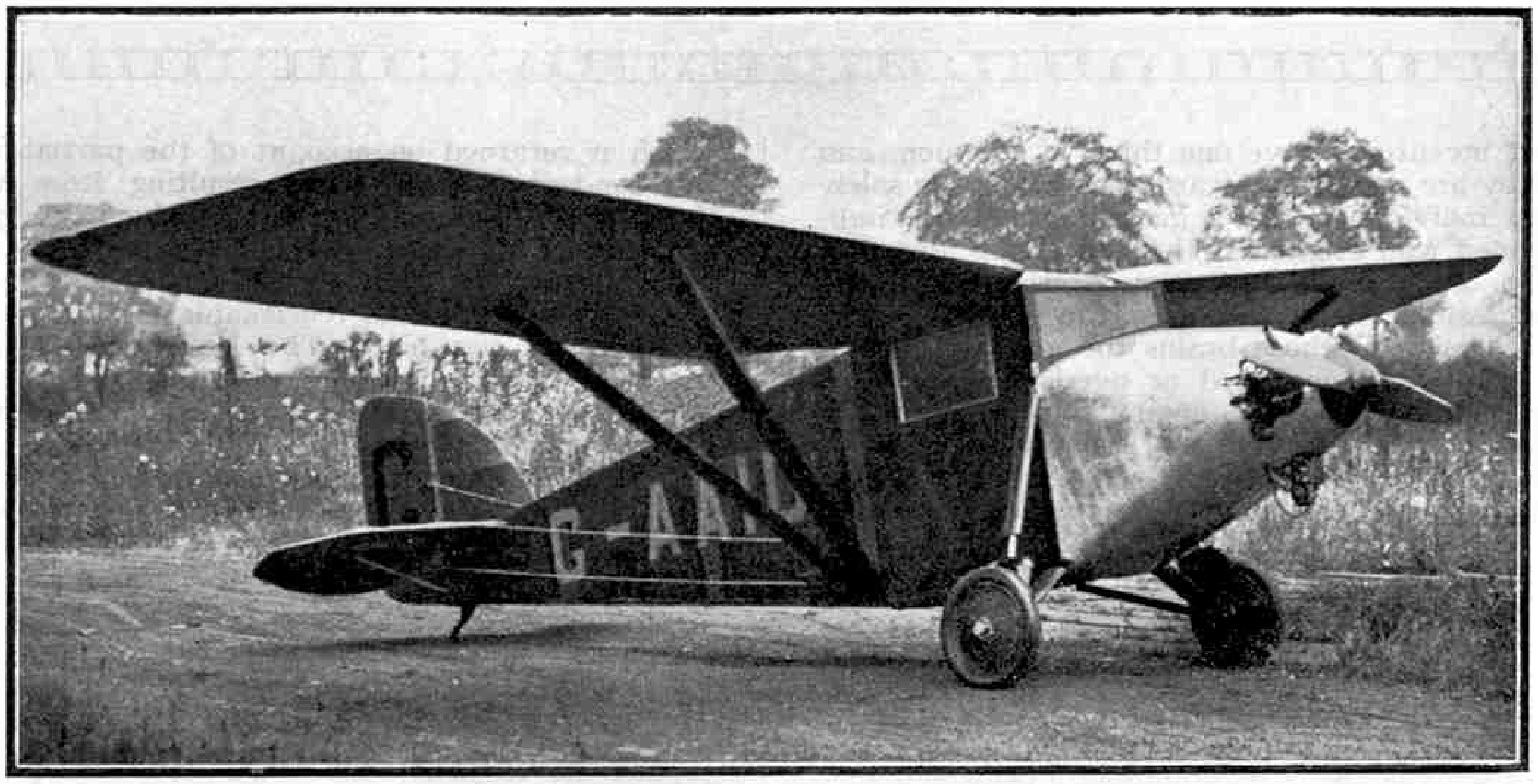
The "Robin" is a high-wing cabin monoplane capable of cruising in still air at a speed of 85 m.p.h. Its maximum speed is 105 m.p.h., and it lands at under 40 miles an hour. The service ceiling of the machine is 17,500 ft., and the theoretical absolute ceiling 21,000 ft. The cost of operation is remarkably low, for on the average the machine flies 40 miles on a gallon of petrol. Thus the cost of fuel is less than one halfpenny per mile! The fuel and oil tanks provided in the "Robin" carry eight gallons of petrol and one gallon of oil, quantities that are sufficient for four hours' flight at normal speed, and give a range of about 320 miles.

Accommodation in the machine is very comfortable, for it has a totally enclosed cabin, and the owner of a "Robin" may make long flights without wearing flying kit. Adjustable sliding windows on each side of the cabin provide ventilation, and a V-shaped front screen and a top window allow the occupant an uninterrupted view in all directions. A compartment at the rear of the cabin enables all luggage necessary for personal requirements to be carried.

The undercarriage is of the divided or split axle type, a feature that is distinctly advantageous when landings have to be made on rough ground.

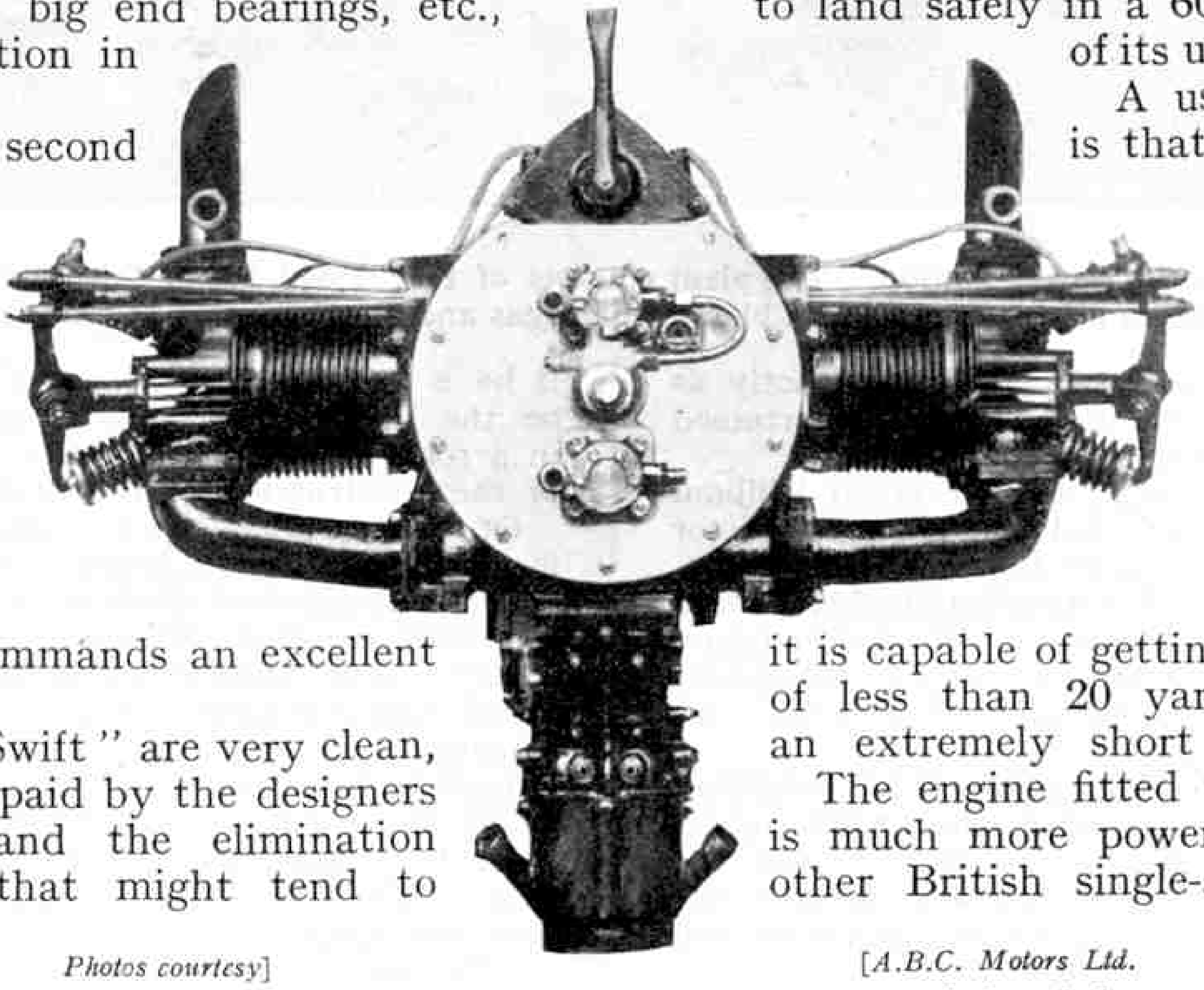
The engine of the "Robin" is the A.B.C. "Scorpion" Mark II engine. This is of the twin-cylinder horizontally opposed air-cooled type. The engine is normally supplied as a "tractor" unit, the airscrew rotating clockwise when looked at from the cockpit, but if required it can be supplied as a "pusher."

When it was designed, the "Scorpion" was submitted to the usual Standard Type Test of the Air Ministry. This was conducted at the Royal Aircraft Establishment, Farnborough, and was quite successful, the engine being in excellent condition at its conclusion.


The A.B.C. "Robin," a single-seater light aeroplane with a totally enclosed cabin.

The cylinders have a bore of 4.015 in. and a stroke of 3.6 in., giving a capacity of 1,500 c.c. The engine normally develops 34 b.h.p. at a normal speed of 2,300 r.p.m., but for short periods not lasting longer than 5 minutes it may be run at a maximum speed of 2,750 r.p.m., when 40 b.h.p. is developed. The fuel consumption at normal speed is 2.21 gallons per hour, while 1.36 pints of oil are required for an hour's flight. The total weight of the engine is 109 lb.

The "Scorpion" engine incorporates several novel features, one of the most useful being that the whole cylinder unit, complete with induction pipe, may be lifted away in one piece after removing the nuts of the cylinder foot studs and those fixing the induction pipe to the crankcase. In this manner, the piston, connecting rods, crankshaft, big end bearings, etc., may be exposed for inspection in a very few minutes.


Photos courtesy] *[A.B.C. Motors Ltd.*

The 35-40 h.p. "Scorpion" aero engine manufactured by A.B.C. Motors Ltd. This engine is fitted to three of the four British single-seater light aeroplanes.

The Comper "Swift," the second machine in the list of single-seater light aeroplanes already given, is a high-wing braced monoplane that is fitted with the A.B.C. "Scorpion" Mark II. It has been designed specially for sporting and touring work. The cockpit is quite open and as a portion of the wing is cut out the pilot commands an excellent view in all directions.

The general lines of the "Swift" are very clean, great attention having been paid by the designers to efficient stream-lining and the elimination of superfluous accessories that might tend to decrease this effect. The undercarriage is of the divided type, and special rubber shock-absorbers carried inside the fuselage of the machine are fitted. A noteworthy feature is that the wheels are not of the usual all-metal construction. Instead they are made of wood and are covered over with metal.

The "Swift" has a wing span spread of 24 ft., and its width when the wing is folded is 7 ft. 6 in. The overall length of the machine is 18 ft. 4 in. Its height is 5 ft. 7 in., and the wing area is 90 sq. ft. The monoplane weighs 331 lb. when empty, and 600 lb. with a full load. The maximum speed of this interesting little aircraft is 105 m.p.h., and the cruising speed between 80 and 90 miles an hour. The landing speed is only 35 m.p.h., and the initial rate of climb 700 ft. per minute.

The Southern "Martlet" is noteworthy as the only biplane civilian single-seater at present in production in England. It has been designed especially for the private owner who requires really high performance with ease of control and manœuvrability, and it is claimed by the Southern Aircraft Ltd., that with the machine every type of aerobatic may be performed with perfect ease and safety.

The "Martlet" has a loaded weight of 1,040 lb., a wing span of 25 ft., and a total length of 20 ft. 3 in. The rate of climb at sea level is 1,100 ft. per minute. The machine has a top speed of 112 m.p.h., a touring speed of 95 m.p.h., and a landing speed of 40 m.p.h. These figures, coupled with the fact that it is easy to land safely in a 60 m.p.h. gale, give some idea of its utility as a means of transport.

A useful feature of the machine is that it is able to land and take off in fields that would be much too small to be suitable for larger craft. With a full load and with scarcely no wind to assist, the machine actually has left the ground in 32 yards, a distance that it covered in 5½ seconds. Other tests have shown that with a 20 m.p.h. wind blowing it is capable of getting off the ground after a run of less than 20 yards. The machine also has an extremely short landing run.

The engine fitted to the Southern "Martlet" is much more powerful than that employed in other British single-seater machines. It is the 75 h.p. "Hornet," a four-cylinder engine that in essentials is a double "Scorpion." The cylinder bore is the same as that of the smaller-powered engine, but the stroke is 4.8 in. instead of 3.6 in. The cubic capacity of the "Hornet" is 3,990 c.c., and the normal power developed is 75 b.h.p. at 1,875 r.p.m. For short periods the engine is capable of a maximum speed of 2,175 r.p.m.

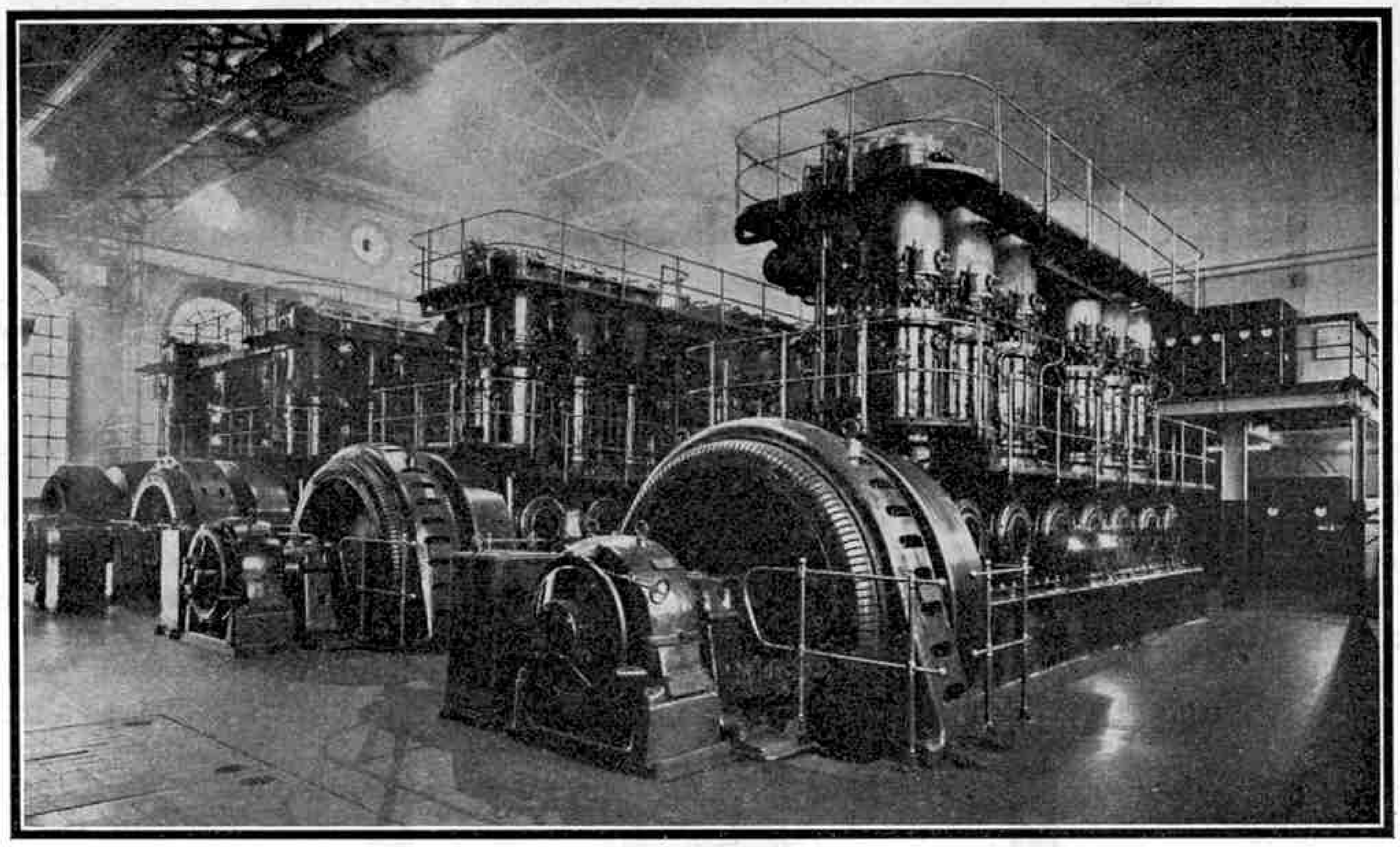
Famous Inventions

XVI.—The Development of the Gas Engine

ALMOST all great inventions have one thing in common, and that is that they are popularly regarded as being due solely to one or two individuals. As a general rule these individuals are not the men who originated the underlying idea, but those who brought a crude mechanism to perfection and made it commercially successful. Only too often the result is that the real pioneers—the men in whose brains the germ of the invention originated—are either neglected or overlooked entirely.

This is the case with the internal combustion engine. We associate the gas engine, for instance, with Lenoir, who produced in 1860 the first mechanically successful engine of this type; and still more with Dr. Otto, who in 1876 improved the engine enormously by compressing the explosive mixture in the working cylinder before igniting it. These men certainly evolved a practical working internal combustion engine, but they did not invent the engine.

The beginning of the story of the internal combustion engine goes back to 1794, when R. Street took out a British patent for a gas engine. The inventor suggested that the gas should be obtained by allowing spirits of turpentine to come in contact with a heated metal surface. The mixture of the vapour with air was then to be exploded in a cylinder, one end of which was closed by a piston exactly as in a modern gas or petrol engine. As far as can be ascertained Street's engine appears to have been unsuccessful.


Courtesy] National Gas Engine Co. Ltd.

A large ironworks power station. The plant consists of four 1,500 b.h.p. "National" vertical tandem gas engines running on blast furnace gas and direct coupled to alternators.

As far back as 27th November, 1820, the Reverend William Cecil of Magdalen College, Cambridge, and subsequently Rector of St. Michaels, Long Stanton, read before the Cambridge Philosophical Society a paper entitled "On the Application of Hydrogen Gas to produce a moving power in Machinery, with a description of an engine which is moved by the pressure of the atmosphere upon a vacuum caused by the explosion of Hydrogen Gas and Atmospheric Air."

Cecil did not confine himself to reading his paper, but exhibited a model of his engine. This was a very crude affair when judged by present-day standards, but it is probable that it was the earliest gas engine that actually worked. It was, in fact, the ancestor of the engines that have revolutionised transport and have made possible man's conquest of the air.

The operation of Cecil's engine was simple. A quantity of the mixed gas in the proportion of two parts of hydrogen to five parts of air was passed along a tube to the engine proper. A small valve, opened and closed alternately by a connection from the piston, allowed a quantity of gas to enter at every stroke. When the valve closed the mixture passed into a cylinder provided with a touch hole at which a flame was burning, and which was momentarily opened by another connection with the piston as it returned to the cylinder. In this manner the gas was ignited, and the explosion drove out the piston from the cylinder, to which it returned on account of the partial vacuum formed by the condensation of water resulting from the explosion. As the piston returned it opened the valve in the gas pipe, admitting a portion of the mixed gas as before, and the cycle of operations was repeated.

The cylinder of this remarkable engine consumed 17½ cu. ft. of hydrogen per hour. The engine made 60 revolutions per minute, and it is instructive to compare this with the engines of to-day, many of which make from 200 to 300 revolutions per minute or even more.

Cecil appears to have been greatly disturbed by the noise his engine made, for he suggested that if a large one were constructed it should "be buried in a well, or it may be enclosed in a large airtight vessel!"

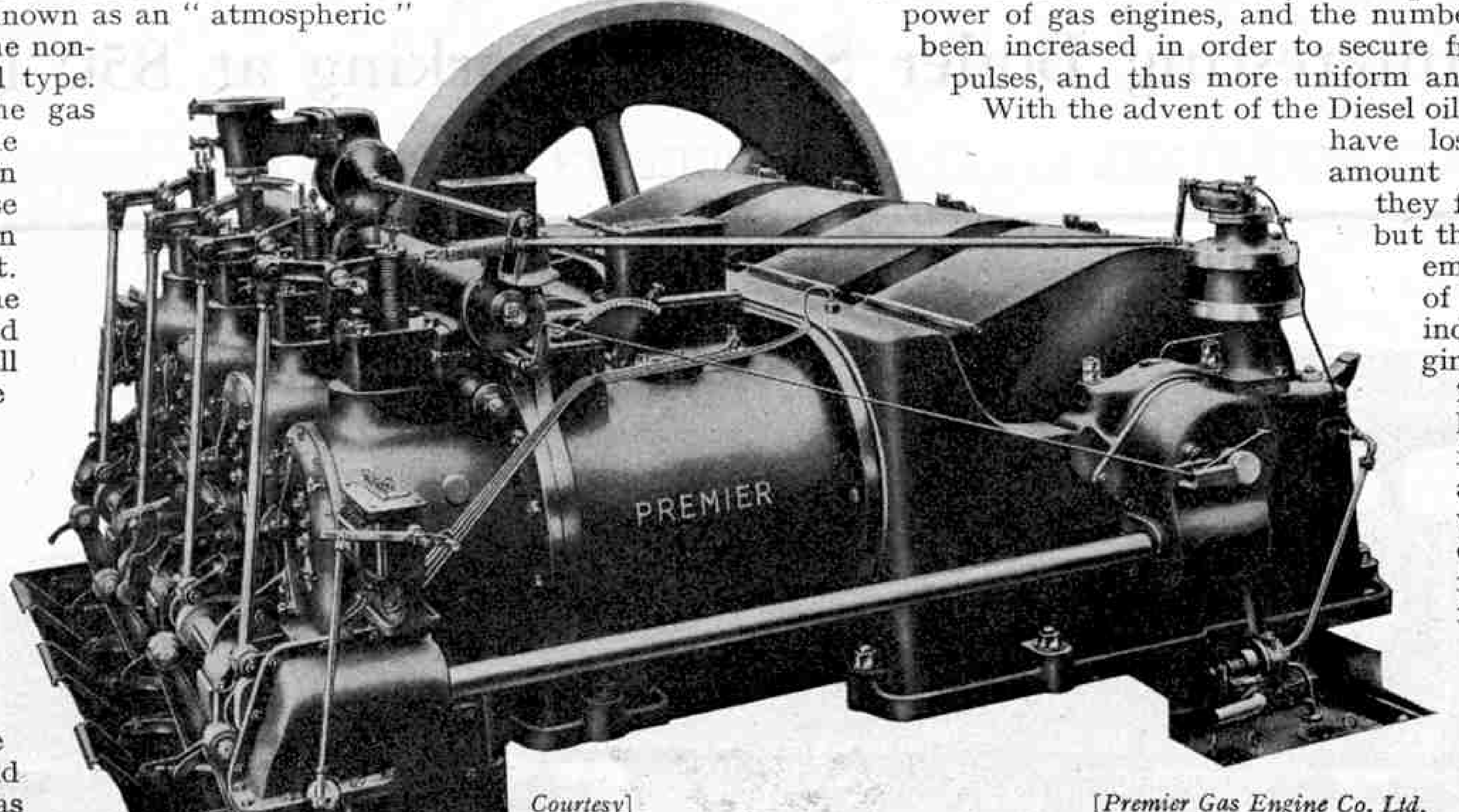
Although Cecil was the first to make a practical gas engine, he was not the only inventor at work on the problem. During his lecture he referred to an engine made by a Professor Farish, in which a piston was driven outward by means of an explosion of gas and air in a cylinder in almost exactly the same manner as in his own invention. Only three years later another successful engine was constructed by Samuel Brown. Its inventor called this a vacuum gas engine, and with it he is said to have worked a water pump, and driven a boat on the Thames. He also is reported to have used his engine in a road vehicle. If so, then to him must be given the credit of the construction of the first motor car.

Of these engines, Cecil's appears to have been most like the modern gas engine. Apart from the fuel, and the compression and the method of ignition of the explosive mixture, there is no really essential difference between his engine and those of to-day. Cecil himself stated that his engine could be run by "coal gas, vapourised oil, turpentine, or any ardent spirit." Apparently he did not test any of these fuels, however, but confined himself to hydrogen which, by reason of its extremely high cost, made his engine impracticable as a commercial proposition. If he had experimented with the alternative and cheaper fuels it is possible that the internal combustion engine might have been anticipated by more than 50 years.

After these early attempts the development of the gas engine seems to have been at a standstill until 1860, when a successful engine was produced by J. J. E. Lenoir, a Frenchman, who for many years had been endeavouring to construct a reliable engine that would be small enough and yet powerful enough to drive a self-propelled road vehicle. His engine worked in a somewhat similar manner to a steam engine. Gas was admitted to the cylinder during half a stroke of the piston, and the mixture then fired by an electric spark immediately the valve closed. The return stroke of the piston was caused by a second explosion on the other side, and as the piston returned it swept the burnt gases out of the cylinder. There were thus two explosions for every revolution of the crankshaft.

In 1866 Dr. N. A. Otto and E. Langen introduced a rather curious engine that was superior to its predecessors, notably in being more economical in fuel consumption. It was known as an " atmospheric " engine, and was of the non-compression vertical type. The explosion of the gas occurred early in the stroke under a piston that was free to rise without doing work on the engine crankshaft. At the end of the stroke the gases cooled and their pressure fell below that of the atmosphere. The piston consequently came down, this time doing work through the medium of a friction clutch in gear with the crankshaft. As the piston neared the end of its downward stroke a valve opened and the exploded gas was discharged.

It is interesting to note that this engine used 40 cu. ft. of gas per horse-power developed per hour. It was noisy and spasmodic in action, but it came into extensive use, and it is generally regarded as being the first commercially successful gas engine.



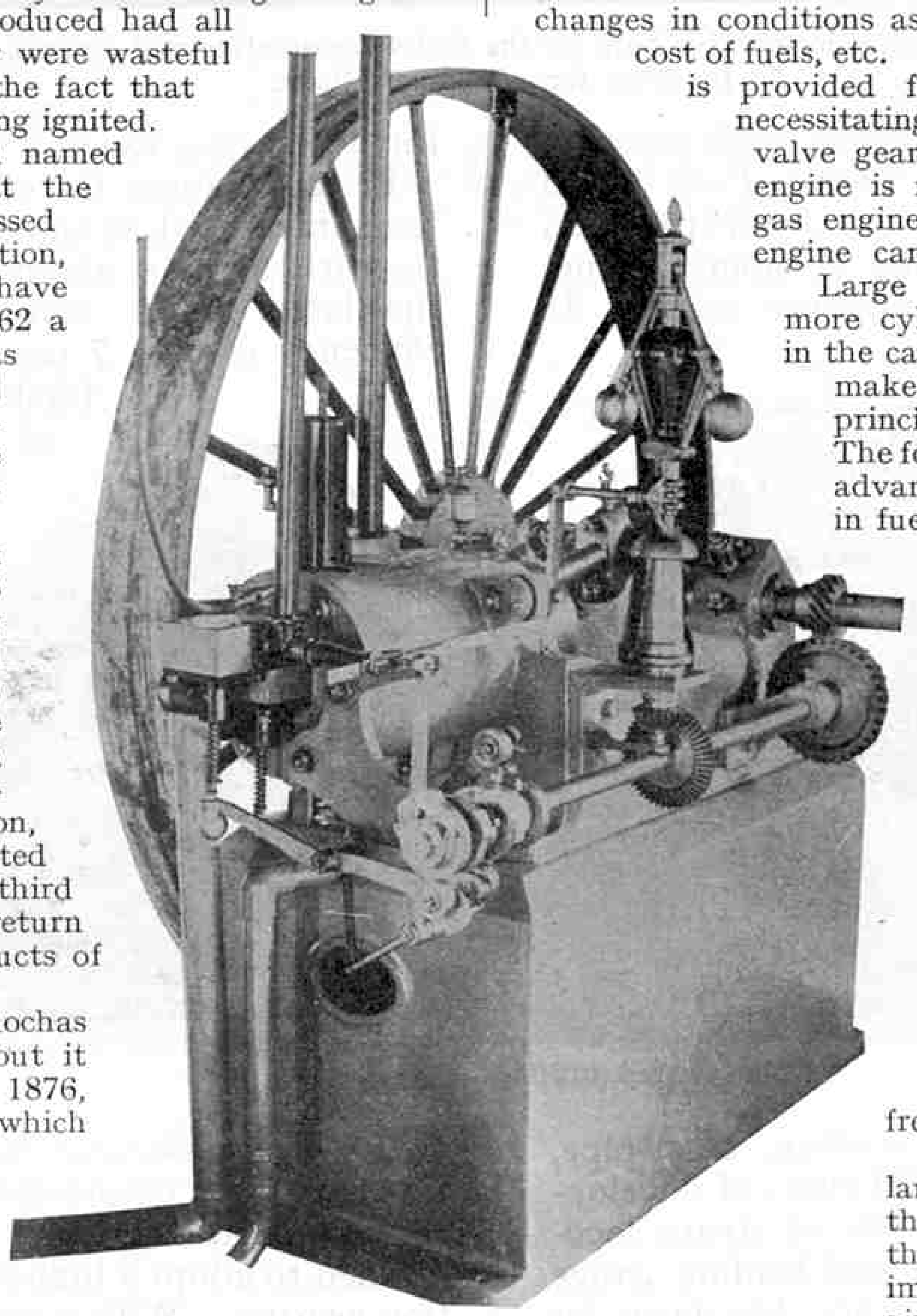
Courtesy] [Premier Gas Engine Co. Ltd.

A modern 500 b.h.p. multi-cylinder " Premier " gas engine, equipped with special compressed air starting gear and magneto ignition.

Up to this time the gas engines produced had all suffered from the same defect. They were wasteful of fuel, and this was due mainly to the fact that the gas was not compressed before being ignited. As far back as 1838 an Englishman named William Barnett had proposed that the explosive mixture should be compressed in the working cylinder before ignition, but no particular notice seems to have been taken of the suggestion. In 1862 a French scientist named de Rochas revived the compression idea, and brought forward a scheme that ultimately altered completely the course of development of the internal combustion engine.

De Rochas described four different operations taking place during two revolutions of the crankshaft. During the first stroke of the piston outward the available space in the cylinder is increased and the explosive mixture is drawn into it through an admission valve. The mixture is then compressed by the return stroke of the piston, at the end of which the mixture is ignited and forces the piston down for the third or power stroke. Finally, the next return stroke sweeps out the gaseous products of combustion through a second valve.

The theory propounded by de Rochas represented a tremendous advance, but it was not utilised in practical form until 1876, when Dr. Otto produced an engine in which the gas was compressed before ignition. In this engine Otto not only secured a more powerful working stroke, but also was able to use a much more dilute mixture of gas, which resulted in very quiet and economical running. The engine worked on the four-stroke principle; that is, there was only one explosion during every four strokes of the piston. A heavy flywheel on the crankshaft, together with the high speed of the engine, corrected any fluctuations arising from the fact that there was only one working stroke out of every four.



Courtesy] [National Gas Engine Co. Ltd.

An 8 h.p. slide valve gas engine built in 1880. The large flywheel and the cumbersome governor are typical of the gas engines of 50 years ago.

The principle of this engine is now adopted in most gas engines, and during the past 20 years improvements in design have been confined very largely to the increase of compression in the cylinders and the substitution of lifting valves for the old sliding type. There has been also a steady development in the size and power of gas engines, and the number of cylinders has been increased in order to secure frequent power impulses, and thus more uniform and smooth running. With the advent of the Diesel oil engine gas engines have lost a considerable amount of the prestige they formerly possessed, but they are still largely employed as a source of power in various industries. Gas engines of as much as 2,000 or 3,000 horse-power are installed at iron and steel works, where they are run on the waste gas from the blast furnaces. In such cases the engines generally are coupled direct to an electric generator to supply current for power and light.

Engines are now available which, designed primarily for working on heavy oil, can be converted with very little trouble to run on town, blast furnace, or natural gas. This is a very useful feature as it enables a power plant to be adapted to such changes in conditions as are brought about by variations in the cost of fuels, etc. In this type of engine a special mechanism is provided for reducing the compression, without necessitating any change to the cylinders or the valve gear. The compression required in an oil engine is much greater than that necessary for a gas engine, and by adjusting the compression an engine can be run equally well with either fuel.

Large modern gas engines have usually four or more cylinders driving a common crankshaft as in the case of a modern type steam engine. Some makers build their engines on the four-stroke principle, while others favour the two-stroke. The four-stroke principle undoubtedly has many advantages, chief among which is its economy in fuel and lubricating oil. In the four-stroke engine the exhaust valve opens only at, or near, the end of the power stroke, and the exploded gases are driven out of the cylinder by the returning piston. A two-stroke engine, on the other hand, loses a part of its power owing to the necessity for opening fully the exhaust port early in the stroke, so as to allow as much as possible of the exploded gases to escape during the short interval available.

Not the least of the many problems encountered in designing a satisfactory gas engine is that of securing quiet running without any sacrifice in general efficiency; and in this direction the four-stroke engine lends itself more freely to the designer.

The efficiency of any gas engine depends largely upon the design of the valves and the gear that operates them. Of the valves, the exhaust valve is probably the more important. The ideal at which the designer aims is to retain the pressure of the exploded gases on the piston head to the last possible fraction of a second, and then to open rapidly the exhaust port. This is by no means easy to attain, and until recently it could be done only by the use of a sharp cam to lift the exhaust port valve, and a very powerful spring to ensure its return to its seating. In theory this appears to be a

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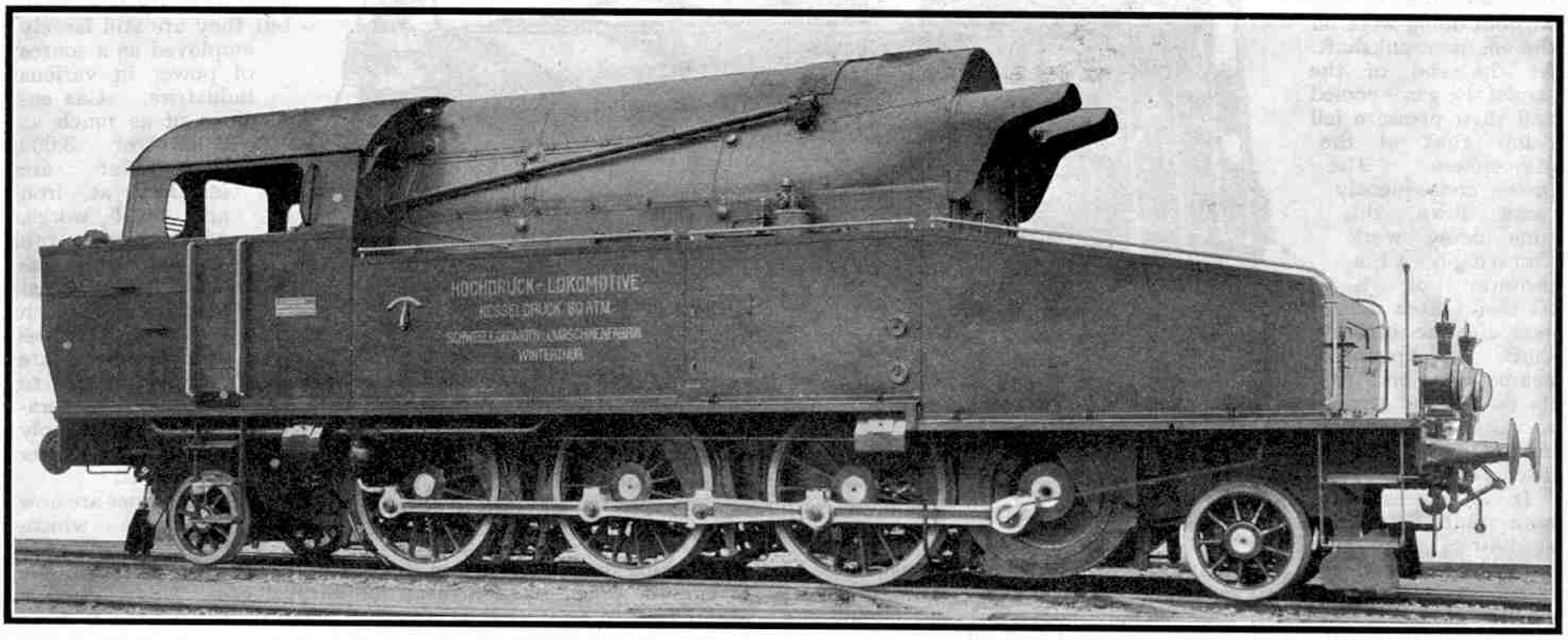
A Swiss High-Pressure Locomotive

Interesting Boiler System Working at 850 lb.

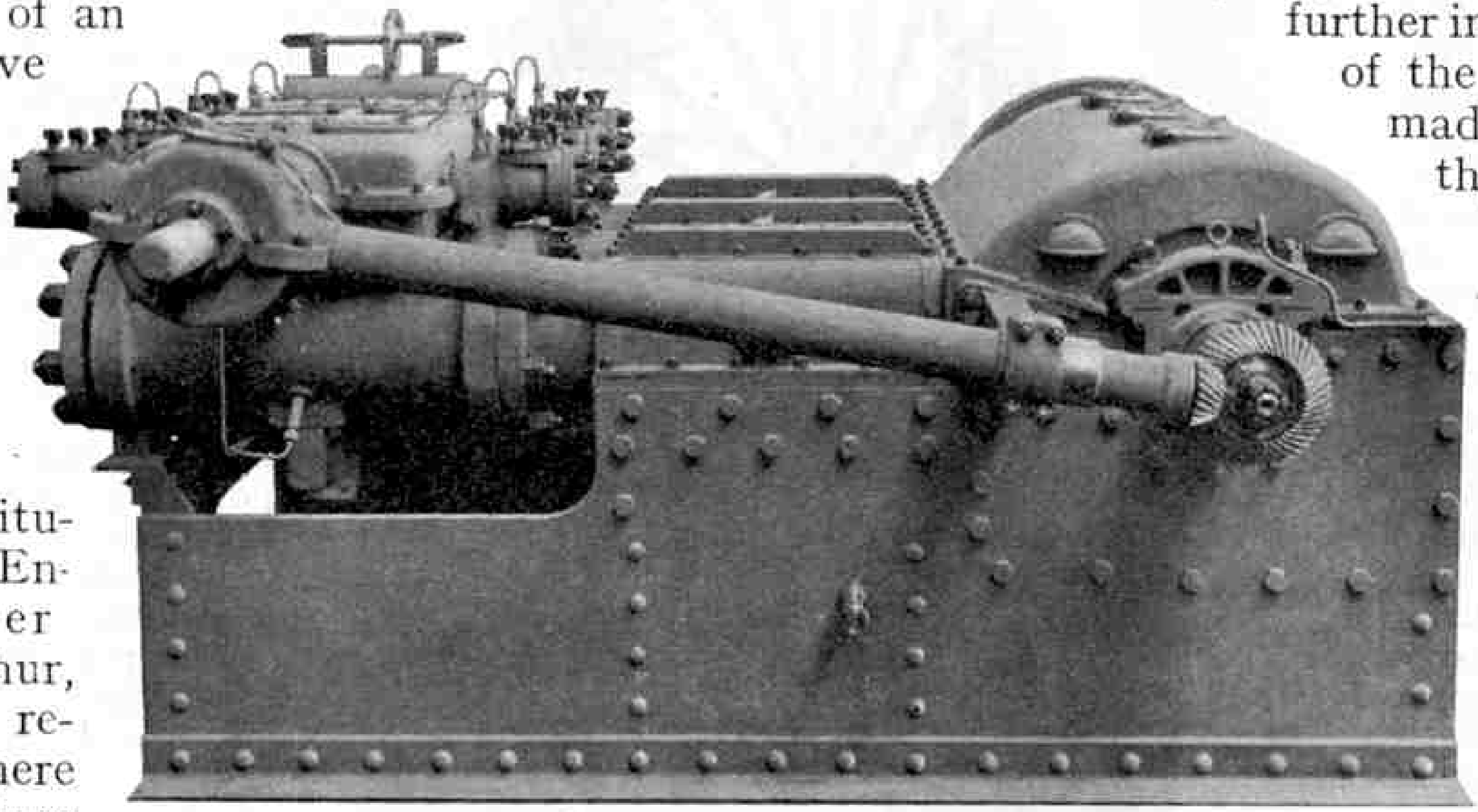


General view of the 2–6–2 high-pressure steam locomotive built by the Swiss Locomotive and Machine Works, Winterthur, to whom we are indebted for our illustrations.

THE appearance of the two British high-pressure locomotives, the L.M.S. No. 6399 "*Fury*" and the L.N.E. No. 10000, has drawn fresh attention to the possibilities of securing greater economy in fuel consumption by the use of high-pressure steam. It will therefore be of interest to give some particulars of an experimental locomotive built by the Swiss Locomotive and Machine Works of Winterthur, Switzerland.

In the course of a description of this locomotive given at a meeting of the Institution of Locomotive Engineers, Dr. Herber Brown, of Winterthur, drew attention to the remarkable fact that there has been no change since the time of Stephenson in the characteristic features of the fire-box, blast-pipe, and direct-acting engine, although 100 years of development have resulted in the production of steam locomotives of 1,000 h.p. for an unchanged loading gauge and width of track. Thermal efficiency has been increased by increasing the boiler pressure from 70 lb. per sq. in.—which at one time was standard—to 140 lb., and then 200 lb. and 225 lb. Compounding brought about a saving in fuel and water of from 10 to 15 per cent.; superheating gave an additional 10 to 15 per cent. saving, and the adoption of feed-water heating effected a still further saving ranging from 7 to 10 per cent.

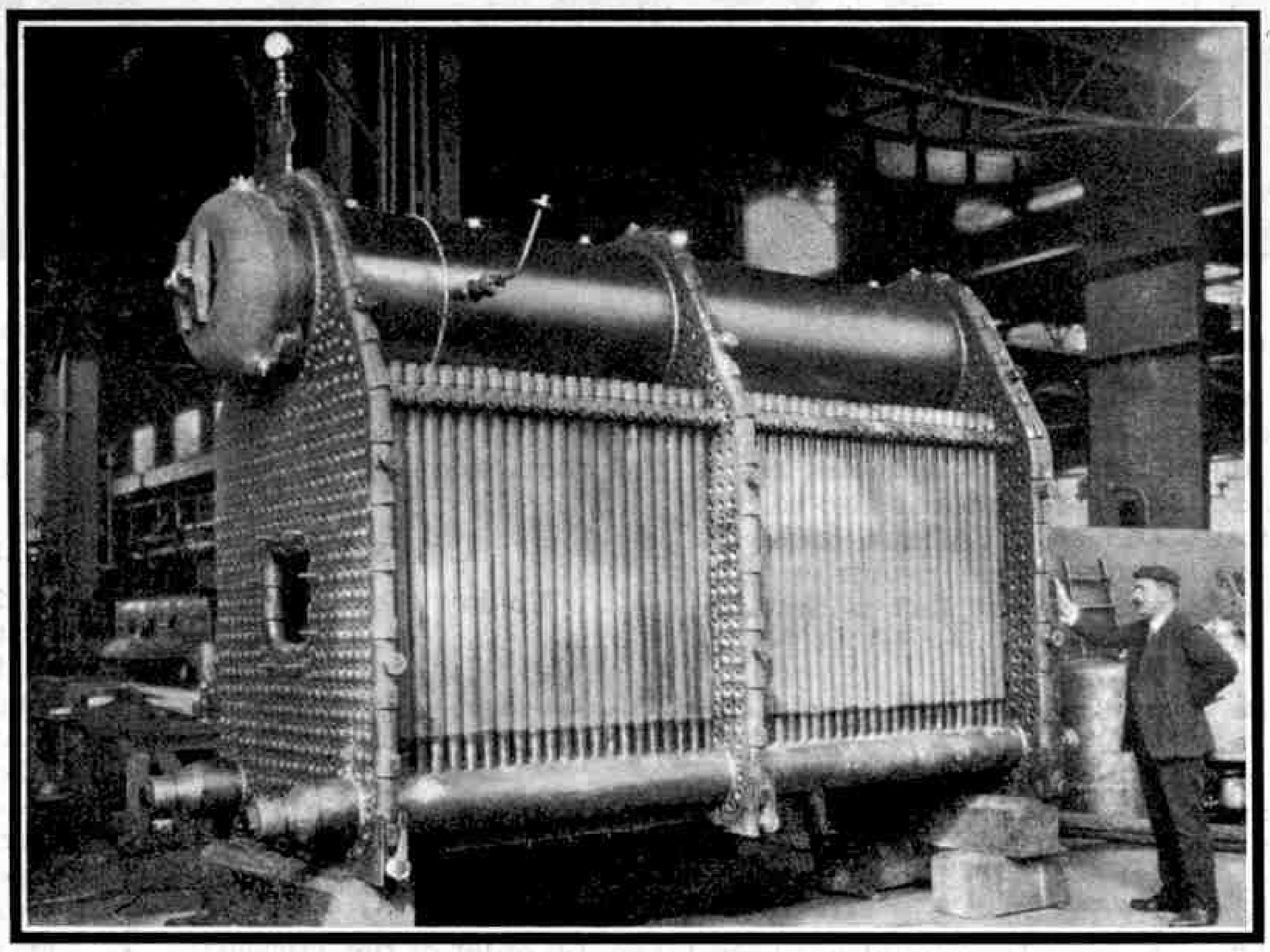
In this manner the coal consumption per horse-power hour, measured at the drawbar, has been reduced from the early figure of about 11 lb. to about 3.3 lb.; but even the latter figure corresponds to an overall thermal efficiency of only 7 per cent. It is difficult to see how further improvements on a locomotive of the Stephenson type are to be made, and it appears certain that new methods will have to be explored. Two of the most promising of these methods are the widening of the pressure range and temperature by the adoption of either condensation or very high steam pressures, or perhaps both.



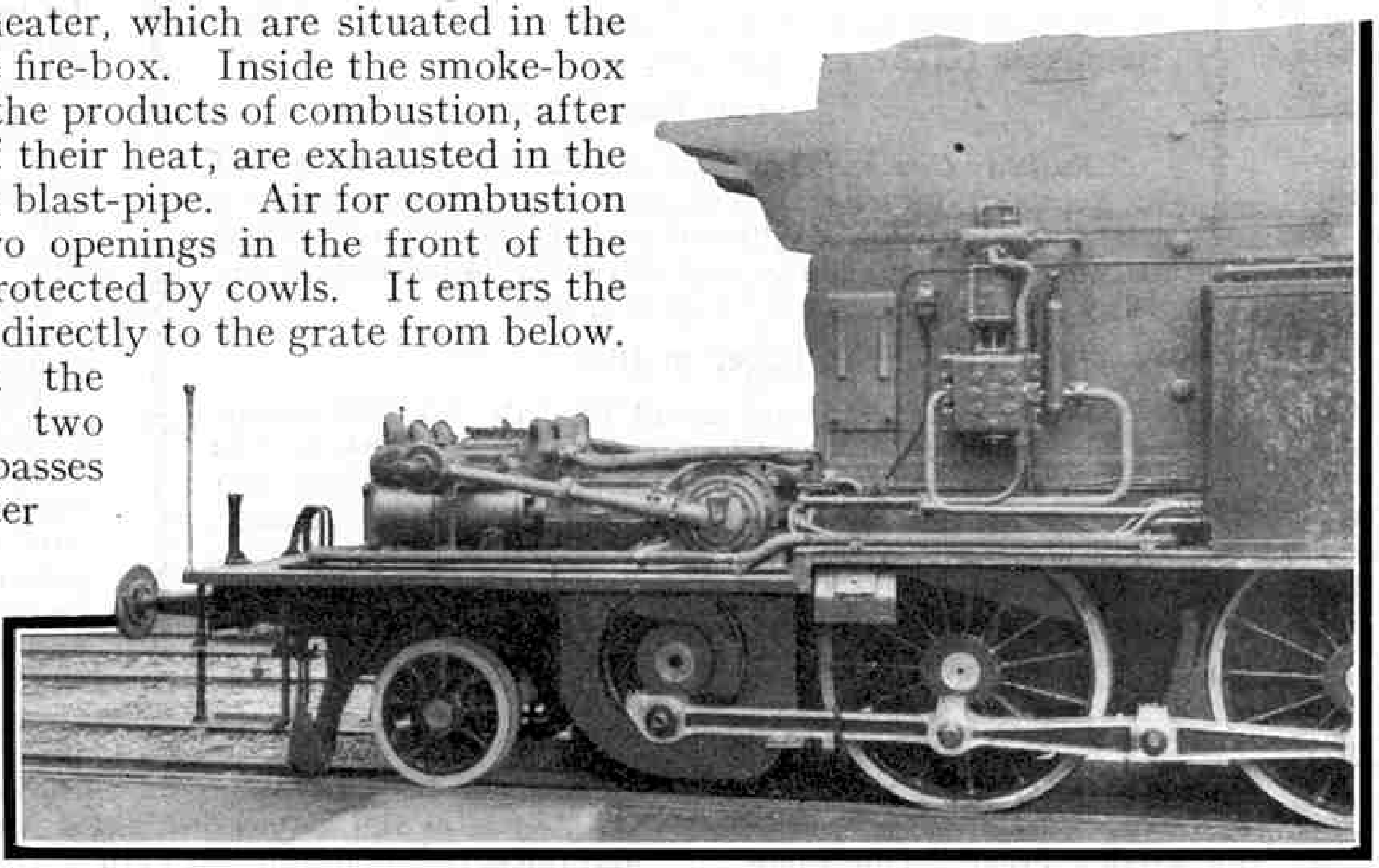
The geared uniflow steam engine.

In 1926 the Swiss Locomotive and Machine Works decided to build a locomotive to work at a maximum boiler pressure of 850 lb. per sq. in., with an average working pressure of about 700 lb. Condensing was left out of consideration from the first on account of the complications that it would have involved, and it was decided to adopt a high-speed uniflow engine with reduction gearing. With a geared locomotive it is possible to construct a standard engine and, by the employment of different gears, to utilise the engine for either passenger or goods services as required. Another advantage with a geared locomotive is that irregularity of drive, which in the ordinary type of steam locomotive may sometimes be as high as 25 per cent. at the driving wheels, is reduced by gearing to as low as 8 or 10 per cent. It is claimed that by this means the adhesive weight of the locomotive is better utilised, so that either the tractive effort may be increased for equal axle pressure, or the number of driving wheels may be reduced, with a corresponding decrease both in weight and first cost. The boiler and engine were first constructed and tested thoroughly on a test bed, and the results were so satisfactory that the locomotive itself was then built.

The engine has six coupled wheels with a Bissel truck at each end. The water-tube boiler is placed directly on the frames, and it has a smoke-box and blast-pipe with a short chimney at the forward end. The unusual shortness of the boiler allows the geared three-cylinder engine to be placed in front of the boiler without increasing the total wheelbase, and this arrangement makes the engine accessible from all sides when the protecting hood is withdrawn. Power is transmitted through a jack shaft to the driving wheels by means of side rods. Water is carried in one rear tank, over which is arranged the coal bunker, and two side tanks.


The water-tube boiler, working pressure 850 lb. per sq. in.

The combustion chamber of the boiler is boxed in by the tube elements, and is fitted with a fire-grate of the normal type. The combustion gases pass a water-space wall stayed by small tubes, and reach the superheater and the feed-water preheater, which are situated in the boiler flue in front of the fire-box. Inside the smoke-box is an air preheater, and the products of combustion, after having given up most of their heat, are exhausted in the ordinary manner by the blast-pipe. Air for combustion is taken in through two openings in the front of the smoke-box, which are protected by cowls. It enters the preheater and is carried directly to the grate from below. Steam is taken from the regulator, which has two safety valves, and it passes through the superheater to the engine. The exhaust steam is carried to the blast-pipe, but a certain portion of it is led off by a branch connection to an exhaust steam preheater for the feed-water. A supply of auxiliary steam from the cab is taken for the high-pressure compound feed pump, and this is superheated in a separate coil. This pump lifts water from the feed tank and forces it through the feed-heaters. The first is heated by the exhaust steam from the pump, and also by a portion of the steam from the engine cylinders. The water is heated up to from 175° to 195°F. before it enters the main feed-heater inside the boiler itself; and finally it is raised to approximately boiling point before passing into the top boiler drum.


View of high-pressure locomotive with front hood removed to show the engine.

The water-tube boiler consists of a large top drum that acts as a steam accumulator, and two smaller bottom drums, which are interconnected by welded water-space walls and a number of tube elements. An important feature of the boiler system is that the formation of scale is restricted to the exhaust steam and main feed-water heaters, from which it can be removed without difficulty.

The engine is designed for single stage uniflow expansion in three equal cylinders, working in parallel. The pistons are of the "self-bearing" type, each cylinder having only one stuffing box. The latter is built up of flexible metallic segments, easily replaceable from the cross-head side. The crank-shaft is supported in four bearings, and is fitted with flexible pinions at each end, which mesh with gears keyed to the jack shaft. Steam admission is controlled by single-seat valves, and exhaust by the pistons themselves, which move on exhaust ports arranged in the central portion of the cylinder liner. Cut-off is controlled by cams of different shape, arranged on a shaft that is free to be displaced laterally. Six different cut-off cams are provided both for ahead and reverse. When coasting, the admission valves can be kept unseated by means of compressed air. The surfaces that work in superheated steam are lubricated with superheater oil fed by a plunger pump. The valve gear is arranged inside an oil-tight casing, and the crank bearings are force-feed lubricated through a geared pump. The driving mechanism is arranged in the conventional manner, with the exception of the connecting rods, which are linked to the central portion of the front coupling rods, thereby reducing the troublesome influence of spring motion.

The locomotive is of the 2–6–2T type with driving wheels 4 ft. 8 in. in diameter. It is 43 ft. 1 5/16 in. in length over buffers, the total wheelbase being 31 ft. 2 in.; while the overall height is 14 ft. 0½ in., and the overall width 9 ft. 3/16 in. As already stated, the boiler pressure is 850 lb. per sq. in. The three cylinders are 8½ in. in diameter, and the piston stroke

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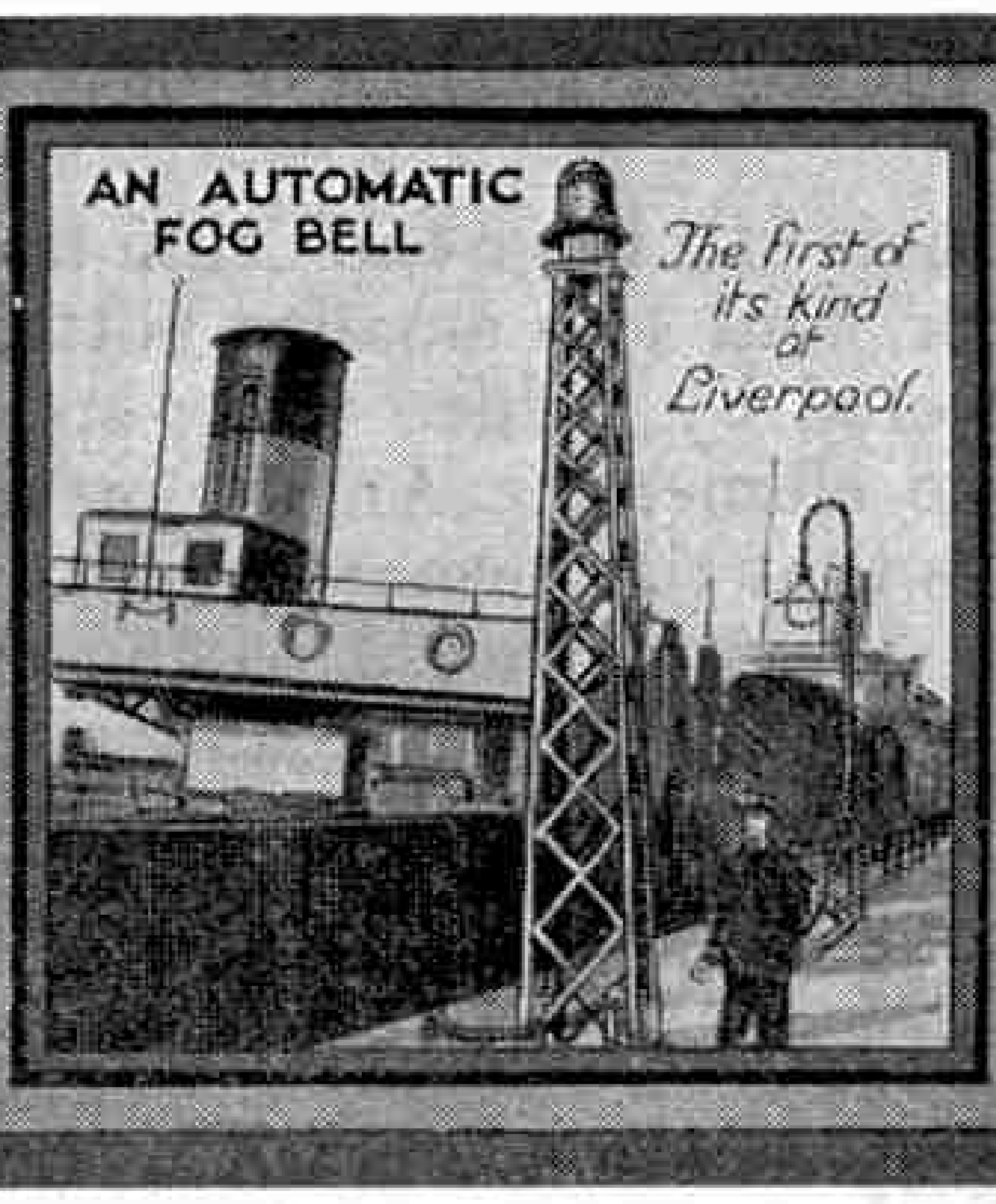

AN AUTOMATIC FOG BELL
The first of its kind of Liverpool.

Of General Interest

A Vanished Continent

The news that a British scientific expedition is now engaged in a study of Madagascar is very interesting, for this large island is a scientific mystery. Its animal and bird life shows traces of resemblance to that of Africa on the one hand and also to that of Malaya, and even of Australia and New Zealand, although thousands of miles of sea now separate these countries from Madagascar. One suggested explanation of the fact is that the island is one of the remnants of a long vanished continent that is believed to have stretched across the southern portion of the Indian Ocean. This continent probably included the countries referred to, and possibly large tracts of South America also. Thus many of the creatures now inhabiting these lands have descended from common ancestors.

If it took place suddenly, the disappearance of Lemuria, as this supposed ancient continent is called, would have been a catastrophe as great as the fabled destruction of Atlantis. It is scarcely likely that such an extensive tract of land would be overwhelmed by water at one stroke, however, and Lemuria probably broke up as the result of slow sinkings and upheavals that continued for millions of years.

The reason for the disappearance of the continent was simply that it was wrongly placed. Its greatest length was along a line parallel to the equator and continents running in this direction appear to be unstable. Those stretching from north to south are more permanent. A glance at a map of the world shows this, for the greatest lengths of most of the continents are along lines joining the poles, the two Americas being an excellent instance.

The rotation of the earth probably helped to break up Lemuria. This event is believed to have occurred in the distant past, when the continents were practically afloat on a molten layer of lava or basalt beneath the earth's crust. The thick liquid was carried round by the spinning centre of the earth, but the crust had a tendency to lag behind owing to the pull of the moon Thus the molten basalt tore at the roots of the continents and caused masses at their eastern ends to break away. The effect was most marked near the equator, for nearer the poles the actual speed of movement was less. Lemuria was in a position where it could most easily be broken up, therefore, and accordingly it disappeared.

Other instances of the eastward movement of portions of continents possibly caused in this manner are known. For instance, mountainous New Zealand may have been carried away from the east coast of Australia. It also has been suggested that the pressure of the basalt has pushed South America eastward and out of line with North America. This is by no means impossible, for the Andes are higher than the Rocky Mountains and their roots went deeper into the molten basalt.

Over a Hundred Years Ago!

Heavy Traffic in London!

"An account has been taken, by order of the Treasury, of the number of vehicles passing over London Bridge (in its present state) in the course of 24 hours—the average for which turns out to be between six and seven thousand."—"HAMPSHIRE ADVERTISER," June 7th, 1828.

An Early Telegraph Line

"We have heard that it is in contemplation to keep up a regular line of telegraphs on this coast, extending from Portsmouth to the Thames. It is certain that some official inquiries have been made on the subject, and that a new plan (which is not likely, however, to be carried into effect) has been proposed for making communication by night as well as by day, by means of lanterns."—"THE BRIGHTON GAZETTE," June 13th, 1828.

Slow Travel

"*Railway Coach.* The first railway coach constructed in Scotland for the conveyance of passengers made a trial journey in the neighbourhood of Airdrie on Tuesday. It is drawn by one horse, and will carry 24 passengers."—"LIVERPOOL MERCURY," July 18th, 1828.

Eager to Rise

"When Blanchard was about to make his first ascent in a balloon from the Champ de Mars in 1784, a fine boy of 16, from the Military School, drew his sword, and insisted on accompanying the aeronaut. The demand was rejected; but his enthusiasm was applauded, and some persons predicted his future elevation. The prediction was certainly realised. That boy was Buonaparte."—"THE TIMES," August 16th, 1828.

Unexplored Country in South America

To-day the world's least known territory is the Matto Grosso district of Brazil. This is a high plateau 1,500 miles in length and 1,000 miles in width, that has not been touched by glaciers and has never been covered by the sea. It is a wonderfully healthy district and recently has become important because of the suggestion that it may have been the place where the human race developed. The origin of this idea may be traced to rumours of the existence in it of remains of a more ancient civilisation than any yet known to us.

Conditions in the Matto Grosso are particularly favourable for the preservation of ruins and rumours of the existence of traces of great cities in the interior of Central America eventually may be found to have truth in them. Rumours of this kind have been current since the discovery by Europeans of America, and it was while searching for remains of these cities that Col. Fawcett, the British explorer, lost his life. Expeditions are now being organised for the purpose of making a thorough examination of the entire district.

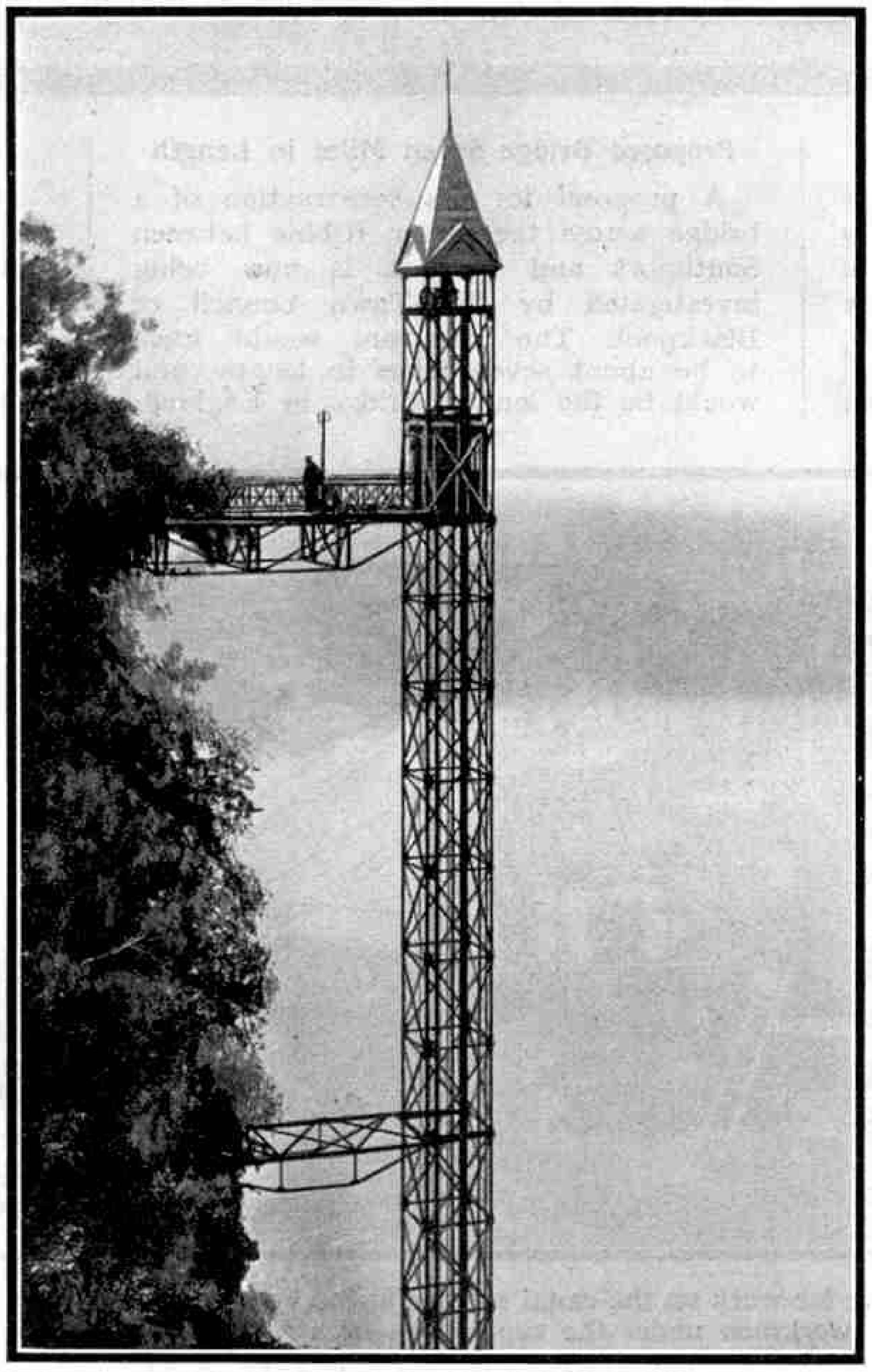
There is nothing improbable in the suggestion that the Matto Grosso may have been the birthplace of the human race. The many points of similarity between the civilisations of the races that have inhabited America and those of the Old World show that these probably had a common origin. For instance, the Egyptians had practically the same conventional signs of the Zodiac as the Mayas of Central America, the Aztecs of Mexico and the early inhabitants of Peru. The figures have no meaning in themselves, and the fact that they were used on both sides of the Atlantic Ocean inevitably suggests that they were carried from one continent to another. Usually it has been supposed that the ancestor of man was first developed in the Eastern hemisphere and that the race spread to America across the Bering Straits or by way of the islands of the Pacific Ocean. Now there appears to be some ground for believing that the reverse process may have taken place, and for this reason news of the findings of the explorers of the Matto Grosso district will be awaited with even keener interest than that usually displayed in discoveries made in unknown regions.

Masters of the Earth

Even in Nature brains count for more than brawn. It seems to be the fate of such monsters as the mammoth to die out, apparently because they lack intelligence to succeed in the struggle for existence. Smaller animals appear to adapt themselves more readily to their surroundings. The proof of this is that to-day the lordship of the earth is contested, not by the elephant and the hippopotamus, but by man and the insect.

At the present moment the greatest menace with which man has to deal comes, not from big game, but from insects. It would be quite impossible to number the insect population of the earth, and there are so many of them that the destruction of a few millions of any particular species has no visible effect. More than half a million kinds of insects are already known and new ones are being discovered at the rate of several thousand annually.

The earth does not appear to be large enough to hold at the same time the numbers of human beings and insects now trying to maintain themselves on it. If man's warfare on these enemies ceased it is probable that he would perish for lack of food, for the vast hordes of insects would then eat every scrap of the corn and fruit on which man relies for food for himself and his domestic cattle.



This elevator, on the Burgenstock Mountain Railway, rises perpendicularly up the face of the mountain to a height of 500 ft.

Germs in the Air

A prominent doctor of Los Angeles made an ascent in the Goodyear airship "*Volunteer*" in order to discover if there were any diseased germs in the upper atmosphere. He found them in large numbers and thus justified the old superstition that death literally may rain from the skies. Even on the earth's surface germs do not usually float about in full grown or adult form, and those suspended in the air are in the form of spores, or seeds of germs. So long as they remain dry, and are not subjected to destructive chemical action or exposed to ultra-violet radiation they appear to retain their vitality for very long periods.

Bacteriologists tell us that it is these tiny spores that are generally responsible for the spread of disease. They drift over enormous distances, and from the clouds, in which they are safe from the destructive rays of the sun, they are conveyed earthward in rain or snow.

Many other things in addition to germs and their spores are found in the atmosphere of large cities. For instance, the air above New York has been found to contain particles of motor car tyres, asphalt, brick, excavation rock, and leather as well as horsehair, cotton and slivers of glass!

Haymaking Machine Mistaken for Dinosaur

A discovery recently made in Morocco aroused great excitement in the scientific world. This was the fossilised remains of a dinosaur unearthed near Tetuan, in Spanish Morocco. These attracted more than the usual attention given to such discoveries, because a preliminary examination suggested that the prehistoric monster that appeared to have been buried near Tetuan was of a type that hitherto had been thought to have lived only in the Rocky Mountains.

Scientists immediately hurried to Tetuan in order to dig out and examine the very interesting and precious relic, and in the meantime there was much speculation on the problem of how the dinosaur had managed to cross the Atlantic Ocean. Suddenly all speculation came to an end, and it became quite clear that the remains had crossed the ocean in an ordinary steamer, for instead of the fossilised bones of a dinosaur the members of the scientific mission found the ribs of a haymaking machine manufactured in Canada!

The "dinosaur" had belonged to a Spanish farmer who had been compelled to abandon his property in 1917 owing to the outbreak of war with the Riffs. A landslide caused by heavy rains had buried the abandoned machine and later on the curved iron teeth of the ribs had been mistaken for the ribs of a prehistoric animal. When the rust and sand that had caused the error were removed, the name of the Canadian manufacturers was revealed.

The Composition of the Sun

Fifty years ago it was regarded as remarkable that we should know anything about the composition of the Sun. To-day the spectroscope not only tells us what elements are present in that body, but even enables us to find the proportions of each contained in the Sun's atmosphere.

Unlike our own atmosphere, which contains nitrogen and oxygen in the proportion by volume of four to one, that of the Sun is largely composed of the inflammable gas hydrogen, which constitutes 60 out of 66 parts by volume. This is accompanied by much smaller proportions of helium and oxygen, and by metallic vapours that occupy a volume of only one sixtieth of that of the light gas. Thus it may be said that the atmosphere of the Sun consists of hydrogen flavoured with oxygen and metallic vapours. The mass of gas and vapour is at a very high temperature, and it is by analysis in the spectroscope of the light emitted that the presence of these elements in the Sun has been discovered.

Of the metals contained in the Sun it is found that magnesium and iron are the most abundant. Silicon, sodium, potassium and calcium also are present in considerable amount and in addition there are smaller proportions of a very large number of most of the metals known to us on earth.

First Printing Machine

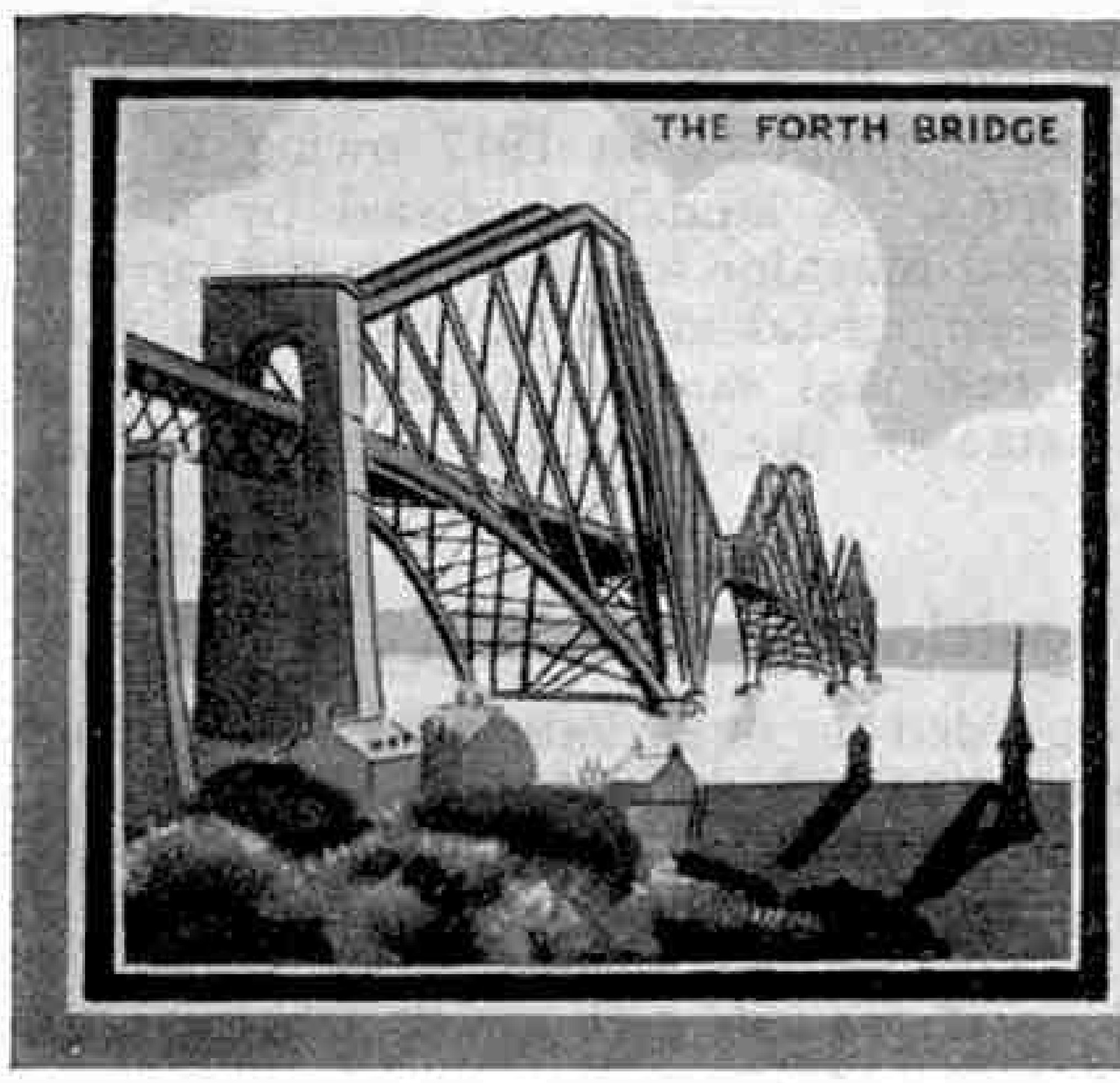
What is described as a portion of the first printing machine ever constructed has been brought from China to England. It is a stone slab weighing nearly six cwts. On its surface drawings of a number of priests and animals are carved, and it is believed that these were reproduced on silk by inking the slab and laying the material on it.

The arrival in this country of the stone has created great excitement among those interested in early art. It has been recognised as a production of the 3rd century B.C., and is thus well over 2,000 years old.

Checking the Watchman

Modern factories and office buildings are so large that in many instances a regular patrol by the night watchman must be organised in order to ensure that each part is duly visited and examined. In order to make certain that the watchman carries out his duties in a proper manner, a "tell-tale" equipment is very largely used. This consists of a clock having a paper dial or strip locked inside. At selected stations in the building specially-made keys engraved with numbers are attached to chains sealed to the walls. As the watchman arrives at each station he takes the key, places it in the "tell-tale" and gives it a half-turn, thus imprinting on the dial or tape the station number and indicating the time of his visit. Every day the used dial or tape is carefully inspected and replaced by a new one.

A definite round for the watchman is usually compiled at the time the system is adopted so that the numbered keys are used in sequence. In some cases, however, the order in which the stations have to be visited by the watchman is varied for each patrol, on account of the possibility of unauthorised persons attempting an entry if the same round were always followed

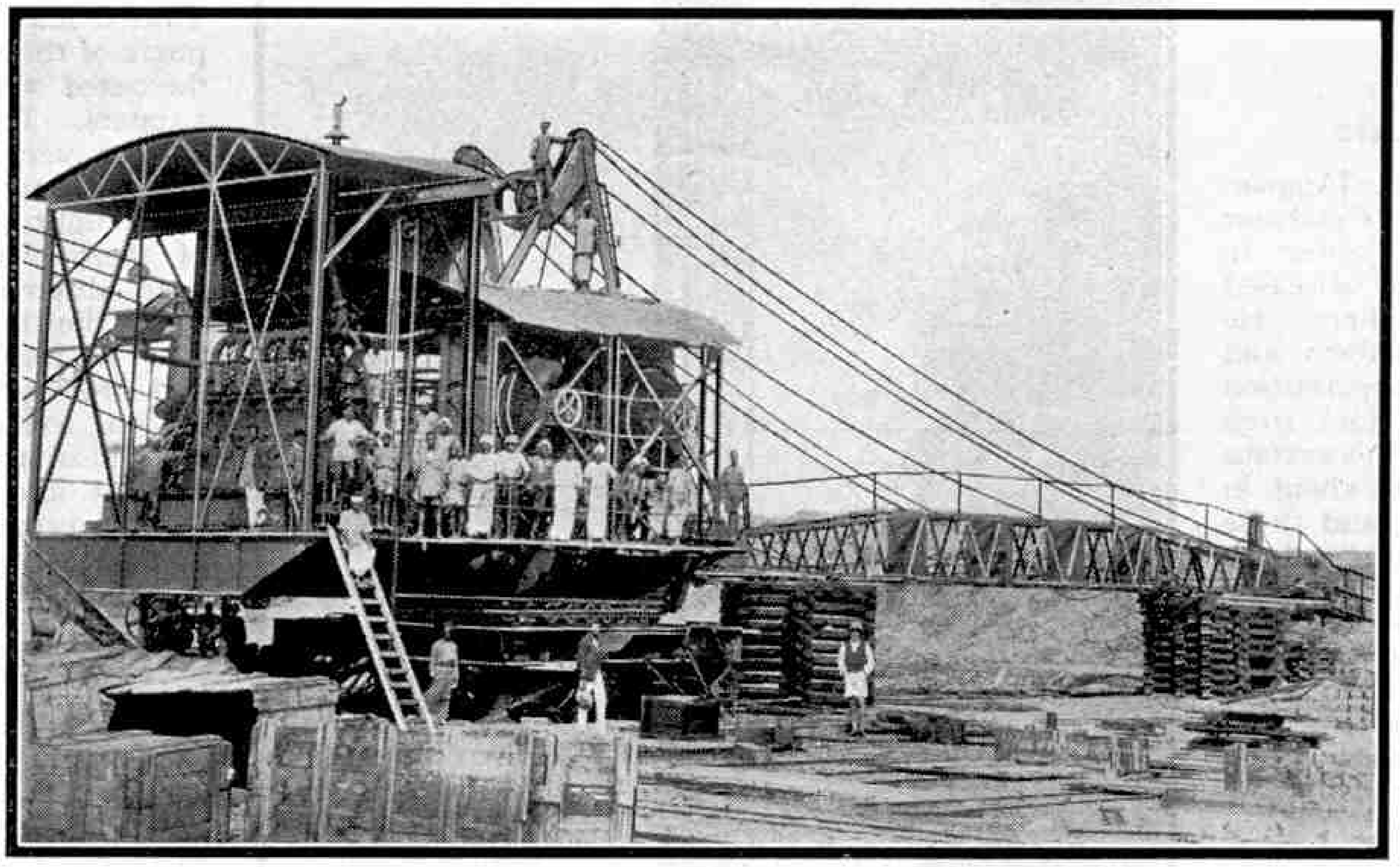


ENGINEERING NEWS

Diesel-Electric Tankers for America

Two oil tankers for use on the New York State Barge Canal have been specially designed to work on the calm waters of canals and also on the high seas. They are propelled by Diesel-electric machinery, and have been named the *"Seneca Sun"* and the *"Cayuga Sun."* Each is 197 ft. in length and 31 ft. in breadth, and draws about 9 ft. of water. In order to enable the vessels to negotiate low overhead bridges they are not fitted with masts or high superstructures, and no part of them is more than 15 ft. above the water level.

Each tanker is fitted with two 300 h.p. Diesel engines operating 130 k.w. generators of the most modern type. The generators provide current for a motor developing 320 h.p., and this operates a propeller shaft that turns at a speed of 180 r.p.m. An interesting feature is that if necessary the vessels may be directed from the engine room instead of in the ordinary manner from the bridge.



A giant dragline for work on the canal scheme at Sukkur, India, being erected by native workmen under the supervision of a British engineer.

The chief purpose of the two vessels will be the delivery of petrol in bulk at various points along the canal, and each has a capacity of 6,000 barrels. They are quite sea-worthy and their regular voyages take them along the open coast between New York and Atlantic City.

New French Training Ship

The first French naval vessel to be designed and built for training purposes was launched recently from the Penhoët shipyard at Saint-Nazaire. The *"Jeanne d'Arc,"* as the vessel is named, is of 6,600 tons displacement and has an overall length of 557.77 ft. The propelling machinery will consist of two geared turbines developing 36,000 h.p. and operated from four oil-fired steam generators. The vessel will be capable of a speed of 25 knots and will have a radius of action of 5,000 miles.

The armament of the *"Jeanne d'Arc"* will include eight 155 mm. guns, mounted in twin turrets fore and aft; four anti-aircraft 75 mm. guns; and two torpedo tubes. Two seaplanes also will be carried.

Proposed Bridge Seven Miles in Length

A proposal for the construction of a bridge across the River Ribble between Southport and Lytham is now being investigated by the Town Council of Blackpool. The structure would have to be about seven miles in length, and would be the longest bridge in England, and indeed one of the longest in the world.

The platform of the proposed bridge would be at a sufficient height above high water level to enable vessels of the highest tonnage now using the River Ribble to pass underneath. A footpath and a roadway would be carried, and the estimated total cost is £3,000,000.

The bridge would be a great asset to the West Coast for it would save traffic from Liverpool to Blackpool, Fleetwood and the north the considerable detour that it now has to make via Preston. It also would enhance the value of the Mersey Tunnel now under construction, and of the contemplated bridge and embankment across the Dee, referred to on page 192 of last month's *"Engineering News."*

Coal-Cutting by Electricity

Coal-cutting by hand in West Sleekburn Colliery, Bedlington, has been superseded by the use of an electrically-driven arc-wall coal cutter, equipped with a jib 7 ft. 6 in. in length. The installation of the machine will greatly speed up production. In this pit the coal is so hard that the older method is uneconomical.

New Egyptian Bridges

It has been announced that two bridges are to be constructed in Egypt, one across the River Nile near Edfina, and a smaller one over a nearby canal. Tenders for the work were submitted by engineering firms from Britain, Germany and Italy, and the contract was awarded to the Cleveland Bridge and Engineering Co. Ltd., of Darlington.

The larger bridge is to be built with four main spans. One of these will be of the swinging type, and will be 53 ft. 3 in. in length. It will be opened and closed by hand, and thus it will not be necessary to station an official on duty at the bridge in order to operate it. Each of the other three spans will be more than 262 ft. in length and the amount of steel required for the construction of the bridge will be 1,553 tons.

The smaller bridge included in the contract will possess a single span of about 46 ft., and only 16 tons of steel will be used in building it. The estimated total cost of the two bridges is £116,000.

Railway Tunnel for Vancouver

According to an announcement recently issued, the Canadian Pacific Railway Company is to start work immediately on a tunnel at Vancouver that will eliminate seven level crossings. With the growth of the Pacific port, road traffic across these crossings has become so heavy that they are now dangerous and the necessity for constructing the tunnel has become urgent. This will be nearly a mile in length and its estimated cost is £429,950.

World's Biggest High-Pressure Boiler Plant

What is claimed to be the largest high-pressure boiler installation in the world is now in operation at a chemical works at Stockton-on-Tees. It is capable of producing 1,680,000 lb. of superheated steam per hour. This is supplied at a pressure of 800 lb. per sq. in. and a temperature of 800°F. The plant is made up of seven boiler units, each of which is fitted for pulverised fuel firing.

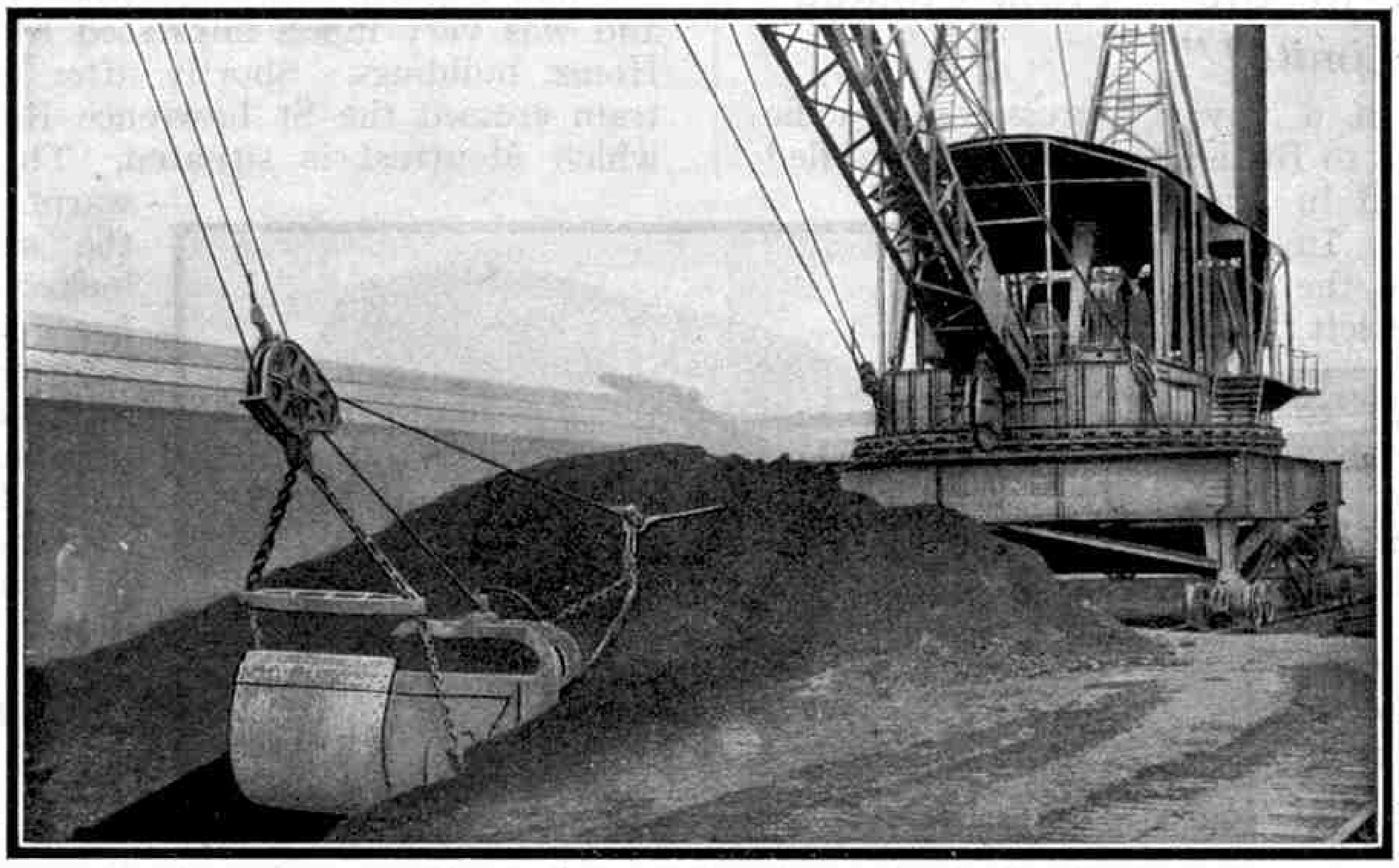
Lorry Driven by Diesel Engine

A Diesel motor lorry is now on sale in Great Britain. This is the product of Kerr-Stuart & Co. Ltd., Stoke-on-Trent, the well-known manufacturers whose Diesel locomotive was fully described on page 32 of the *"M.M."* for January, 1929.

In external appearance the lorry differs slightly from one equipped with an ordinary internal combustion engine in that the front wheels are set further back than usual and the bonnet is left overhanging by about five feet. The driver sits by the side of the engine. The vehicle is capable of carrying a load of seven tons, and is easily manœuvred, for in spite of its length of 22 ft. 3 in. it may be turned in a circle of 28 ft. radius.

The engine fitted to the lorry is of the McLaren-Benz airless injection four-cylinder type. It runs at a maximum speed of 800 r.p.m., but may be slowed down to about 150 r.p.m., at which speed it exerts a satisfactory pull with no " snatching," or spasmodic and jerky running.

The fuel used in the engine of the Kerr-Stuart lorry is crude oil, which costs 4d. per gallon, and the consumption is at the rate of from 10 to 14 miles per gallon. The lorry is economical in running, and according to figures published by the makers the total cost per mile with a full load is only 5.64d. It is very flexible and suitable for driving in traffic, as was shown by a test in which it was driven in top gear over a distance of more than 100 miles. No difficulty was experienced in restarting the lorry with this gear engaged after it had been stopped in traffic. Four forward gears are fitted in addition to the usual reversing mechanism, and with a full load the lorry is capable of climbing any reasonable gradient.



A 350-ton dragline in operation. The bucket excavates 10 tons at one cut. For this photograph and the one on the opposite page, we are indebted to Ruston & Hornsby Limited, Lincoln.

Cleaning the Holland Tunnel Walls

A special machine has been constructed for the purpose of cleaning the white tiled walls of the Holland Tunnel, U.S.A. These become covered with a black deposit discharged from the exhausts of motor vehicles passing through the tunnel, and this is removed by brushing with sodium phosphate solution forced under pressure against the walls.

The plant used consists of an Ingersoll-Rand compressor having a capacity of 200 cu. ft. per min., and it is mounted on a 2½-ton motor lorry to which is attached a trailer carrying two tanks each of 700-gallons capacity. One of these tanks contains water, and the other, the solution of sodium phosphate.

Along each side of the trailer are a number of nozzles carried by short crane arms suitably balanced, and these nozzles discharge the liquids into soft horse-hair brushes operated by men standing on platforms on the trailer. The machine is driven at a speed of 200 yds. per minute.

Spherical Tanks for Helium Gas

In America an interesting experiment is being made with spherical tanks for the conveyance of helium gas for the airships of the U.S. Navy. Each tank is approximately six feet in internal diameter and is built up of two hemispherical plates, each 1½ in. in thickness, welded together. Its weight when empty is about four tons, which is only three-quarters of that of a cylindrical container of equal capacity.

Helium is a very valuable gas and the containers in which it is conveyed must be proof against accident, and before the new type of tank could be used, exhaustive destruction tests had to be carried out. One tank was heated in a furnace to 1,200 degrees Fah., and maintained at that temperature for four hours. Water under pressure was then forced in, and with the gauge registering 1,250 lbs. per sq. in. the tank was revolved slowly on a turntable while four pneumatic hammers maintained a series of sharp blows over a belt of the circumference one foot in width.

This drastic treatment was repeated during three days, after which the tank was loaded between two steel cylinders on a railway wagon. The wagon then was deliberately run off the end of a trestle 20 ft. in height. This violent treatment was intended to produce effects similar to those of a railway smash. The tank survived this ordeal and only gave way when subjected to a bursting test in which a pressure of 4,466 lb. per sq. in. was reached before failure occurred.

New White Star Service for Galway

A new White Star Line service was inaugurated a short time ago by the " *Cedric,*" a twin-screw steamer of 21,227 tons, which left Liverpool for Boston and New York, the first port of call being Galway, in Ireland.

This new service to the United States will be maintained in conjunction with a direct service to Canada operated by the 15,000-ton liner " *Megantic.*" This vessel at present sails only to Halifax, N.S., but after the opening of the River St. Lawrence, she will sail from Galway direct to Quebec and Montreal.

Merchant Shipping Launched in 1929

According to figures issued by Lloyds the number of merchant vessels launched during 1929 was 1,012. The tonnage of these amounted to 2,793,210, and of this total 1,552,623 tons were constructed in Great Britain and Ireland. The number of ships contributing to the British Empire total was 539, of which 50 vessels with a tonnage of 321,141 were built in the Dominions.

During last year second place in shipbuilding was occupied by Germany, where 85 vessels with a total displacement of 249,077 tons were built. Then came Holland with 77 vessels of 186,517 tons displacement, followed in turn by the United States and Denmark. Including coastal vessels and those intended for operation in the Great Lakes, 63 ships with a combined displacement of 126,063 tons were built in American yards, while in Denmark 34 ships having a total displacement of 111,496 tons were constructed.

Comparison with the corresponding figures for 1928 are very interesting. Increases in the tonnage of ships launched are shown by Great Britain and Ireland, Holland and the United States. In the first-named of these countries 69 more ships were built last year than in 1928, the tonnage increase being 86,703. For the same periods the numbers of vessels launched in the United States show no change but in 1929 their total displacement was 34,706 tons higher than in the previous year.

The most striking change is the huge decrease in the tonnage of German shipping launched during the year, however, for this was 126,339 tons less than in 1928. In spite of the decrease the number of vessels actually launched in 1929 was greater by four, and the enormous drop is explained by the fact that the *"Bremen"* and the *"Europa"* contributed to the tonnage figures of the earlier year.

Larger Canadian National Docks

To accommodate the three new coastal passenger ships under construction at Birkenhead, England, at a total cost of over one million pounds, the Canadian National Steamships Company is to remodel and enlarge its docks along the Pacific Coast. At Vancouver the proposed improvements include remodelling the pier and increasing its length to 1,500 ft. and its width to 220 ft. Approach to the pier will be by way of a broad viaduct supported by heavy piling, and through an imposing archway.

Cunard Record Traffic

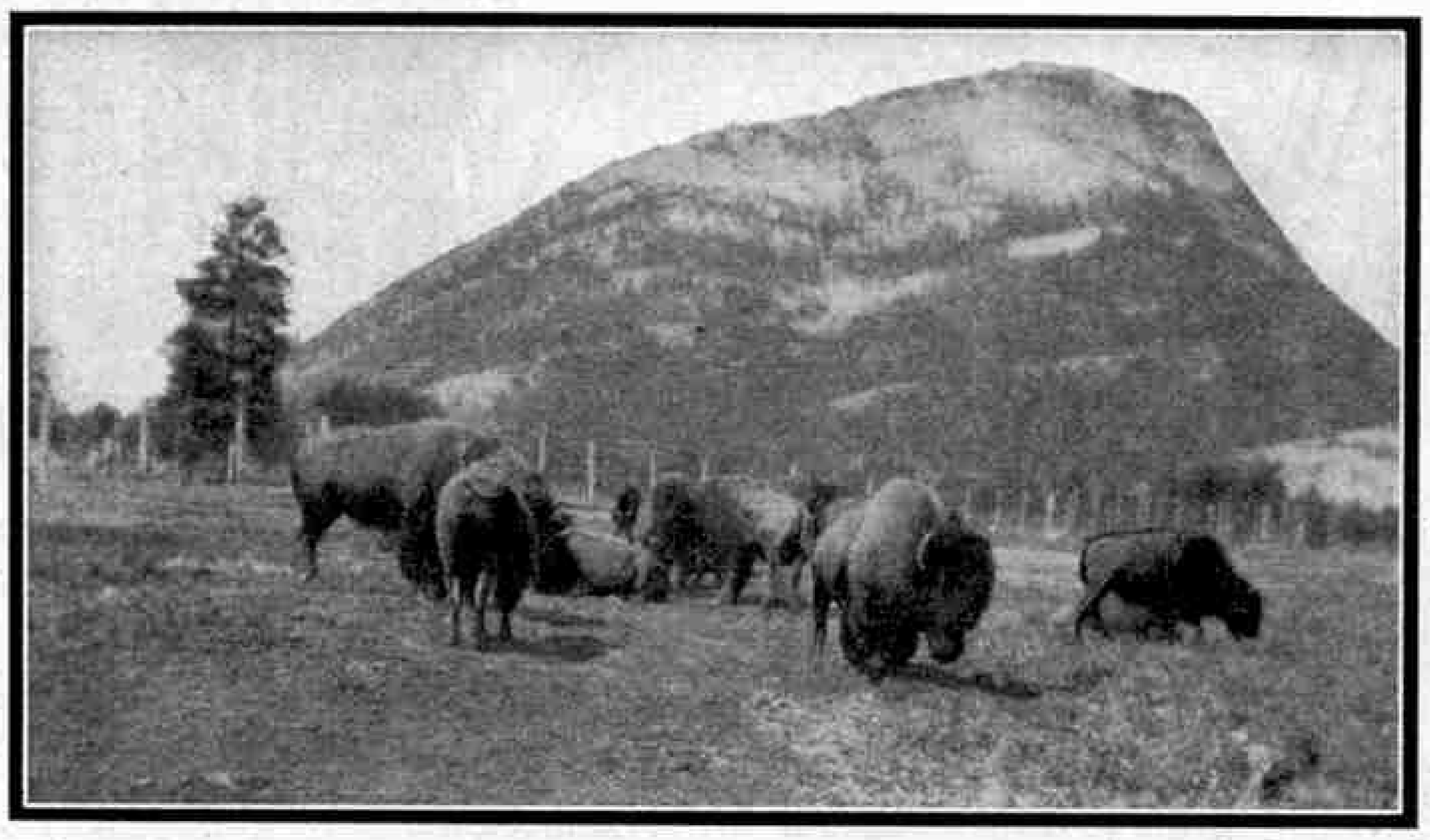
Last year the Cunard Company conveyed 202,185 passengers across the North Atlantic, a figure in excess of that of any other steamship line. This is the sixth successive year that the Cunard Company have held this record.

FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Across America in the "*Trans-Canada Limited*"

At the conclusion of a voyage across the Pacific Ocean from Australasia to British Columbia, I travelled inland by rail to Banff in the Canadian Rockies. In Canada trains keep to the right instead of to the left, and I had difficulty in becoming accustomed to the change. The bell carried on locomotives also interested me. In many Canadian towns the tracks run down the main streets, and for giving warning there, a bell is much better than a piercing whistle.


Bison in the Rocky Mountains National Park, Alberta. Several herds of these animals are now maintained in National Parks and reservations in Canada.

From Banff I travelled to Montreal in the "*Trans-Canada Limited*" of the Canadian Pacific Railway. I boarded this famous express at midnight and immediately sought my sleeping compartment. On waking next morning I went to the spacious and handsome dining car, where the steward presented me with a glass of iced water and a card on which to write down my selections from the breakfast menu. On Canadian trains the catering is on the same scale as in an hotel and from the extensive list handed to me at every meal I was able to choose what I liked.

During the night the train had left the mountains and was on the prairie land where wheat is grown in such huge quantities. The chief objects of interest visible during this stage of the run were huge barns and grain elevators. At every stop I followed the example of other passengers by getting out to stretch my legs. I was interested to notice that it was customary to do this even when the train was brought to a standstill by an adverse signal.

A native policeman on duty in Suva, Fiji Islands.

The train stopped at Winnipeg during the night and I saw very little of this wonderfully progressive city. The journey continued along the shores of Lake Superior, and at Fort William I learned that a C.P.R. boat travelled to Montreal via Niagara Falls. The voyage through the Great Lakes must be wonderfully interesting and I regretted that I was unable to reach my destination in this manner.

I had a good view of Ottawa, the Canadian capital, and was very much impressed by the fine Parliament House buildings. Shortly after leaving this city the train crossed the St Lawrence River to the island on which Montreal is situated. The weather was very warm and the houses in the suburbs of this city looked very bright in the fierce sunshine. Promptly to time the train came to a standstill in the C.P.R. terminus, thus bringing to an end my journey of 62 hours' duration from Banff.

N. Ramsbotham (Pitlochry).

Hailstones as Large as Cricket Balls

Late in June of last year Durban was visited by a violent hailstorm. For at least half an hour hailstones of enormous size fell in great numbers, breaking windows, tiled roofs, and motor car hoods. The jagged pieces of ice were so large and their descent so violent that in many places even corrugated iron roofs were shattered by them. A large proportion of the stones were as large as cricket balls and some actually measured 3½ in. in diameter. It is not surprising to learn that quite a number of people were "knocked out" by them, and had to be taken to hospital for treatment!

After the storm extraordinary scenes were witnessed in the city. Tramcars were at a standstill, partly because crushed ice made the rails slippery, and partly because the drivers feared that they would be derailed by running into the piles of giant hailstones that littered the streets. Motor cars also were useless, for they skidded in all directions, and almost the only vehicle that continued to run was a rickshaw. This is the property of Jim Fish, a well-known Durban character, and his services were in very great demand. The damage done by the storm was enormous, for apart from the extensive breakages of glass and tiles, disastrous collisions took place in the streets, and thousands of feet of telegraph and telephone wire were beaten to the ground. In dodging the tangle many pedestrians slipped on the carpet of icy hailstones and sustained damage due to shock and concussion.

H. E. Deister (Durban).

First Glimpse of Cape Town

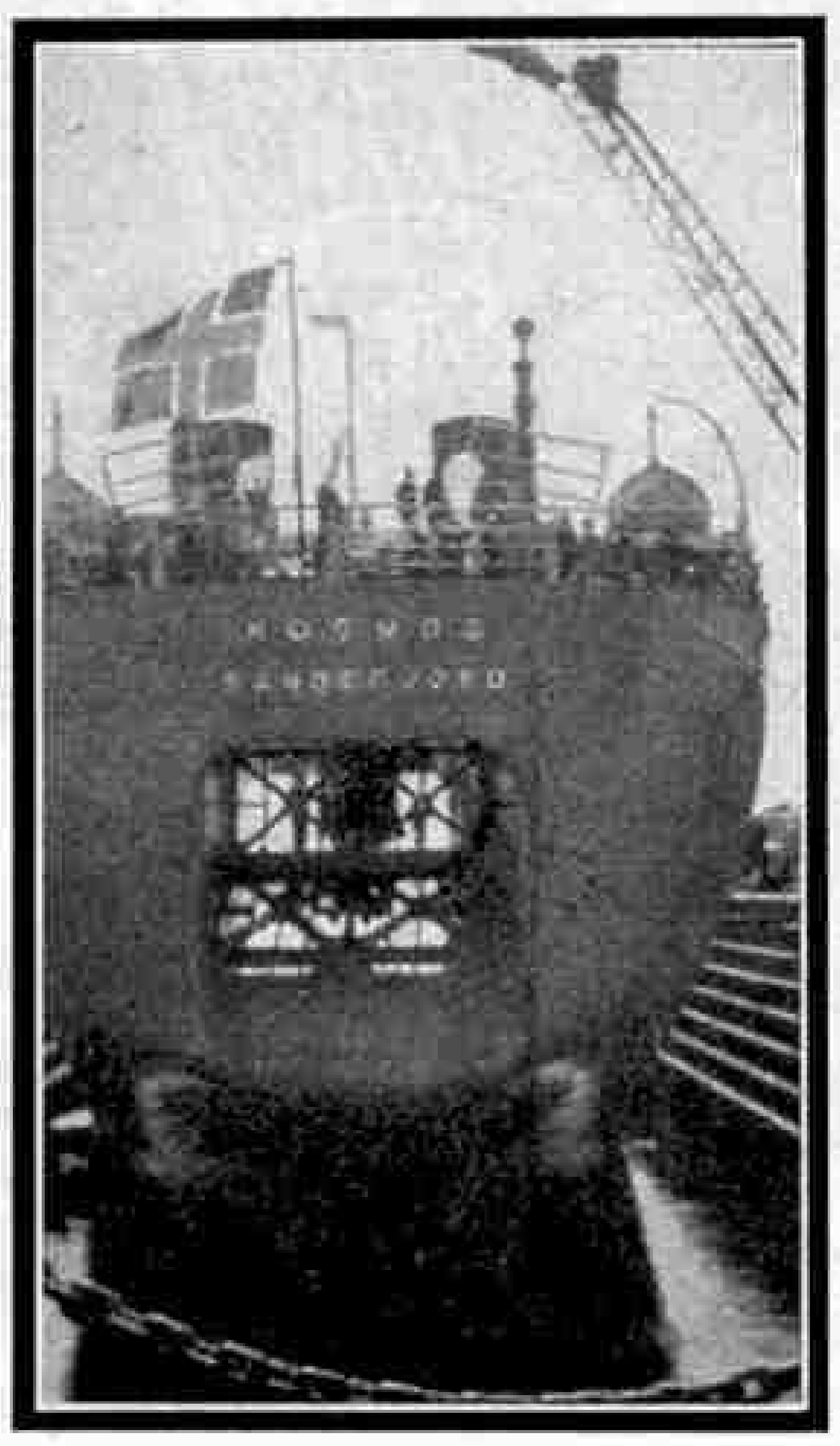
This photograph of the harbour at Cape Town shows how Table Mountain dominates the city.

During my voyage to South Africa I became greatly excited when the Captain of the *"City of Valencia,"* the boat on which I sailed, informed me that early next morning we should arrive at Cape Town. In order to make the most of my first glimpse of the city I slipped on deck about three o'clock. The morning was fine, but it was still dark and far ahead I could distinguish the beams of a lighthouse. Gradually the lights of Cape Town itself became visible and presently I was able to make out the black mass of Table Mountain. To see this wonderful mountain for the first time in the dim light of the early hours of the morning was a very strange and impressive experience.

The *"City of Valencia"* stopped about a mile from shore and the port officials came on board to confer with the medical officer of the vessel. Later we were allowed to proceed and I went ashore, to spend an interesting morning in Cape Town. R. B. Muir (Pretoria).

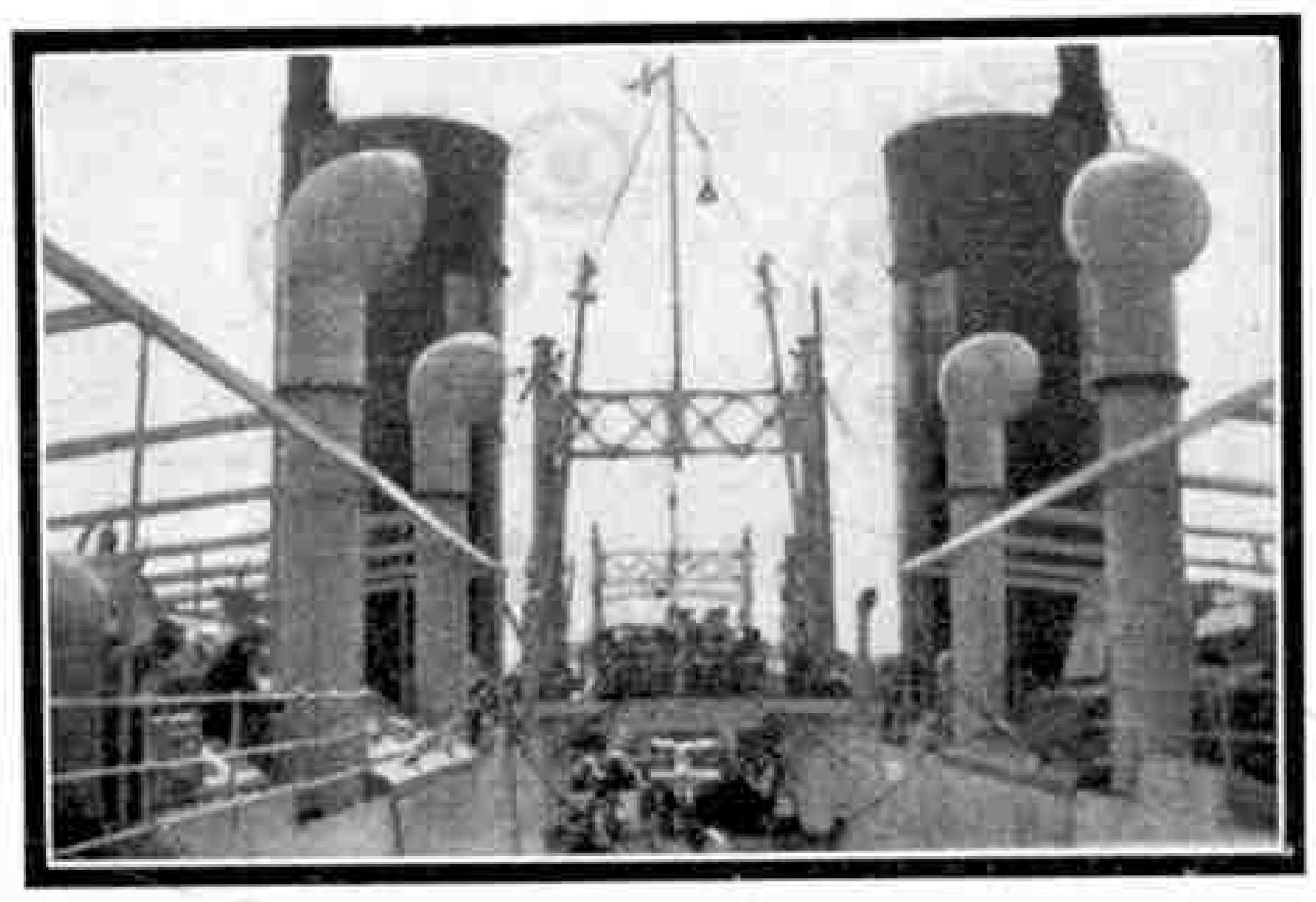
Scouting for Whales by Seaplane

When the *"Kosmos"* put into Falmouth for repainting I eagerly seized the opportunity of paying a visit to this modern whaling vessel. She has a displacement of 32,000 tons and possesses two funnels, that are placed at the sides and towards the stern in order to give ample deck space.



A view of the slipway along which whales are hauled on to the deck of the *"Kosmos."*

The *"Kosmos"* is a Norwegian vessel that has been specially built as a floating whale oil factory ship. She is chiefly remarkable for a large slipway at the stern, up which the carcases of whales may be hauled by means of powerful steam winches. When these reach the wide and roomy deck they are cut up by mechanical saws and the blubber is passed below to the vats in which the oil is extracted.



The two funnels of the *"Kosmos"* are placed one on each side of the deck.

To-day whaling is carried out in a very efficient manner. The *"Kosmos"* is accompanied by a fleet of whaling vessels and carries a "Gipsy Moth" seaplane. This takes up comparatively little room, for the wings may be folded back when not in flight.

On arrival at the whaling grounds the seaplane is lowered to the surface of the water by a deck crane and the pilot and his observer fly off in search of whales. When any of these creatures are sighted a wireless message giving their position is sent to the *"Kosmos."* The trawlers go in pursuit and kill the whales by means of harpoon bombs. Air is then pumped into the carcases in order to keep them afloat, after which they are marked by the insertion of the ship's flag. Later the *"Kosmos"* appears on the scene and one by one the whales are hauled on deck and cut up.

The Norwegian whaling fleet that includes the *"Kosmos"* operates in the Antarctic, and is said to be the first to use a seaplane in scouting for whales. The pilot of this machine also will be able to survey the best route through ice floes, and thus will save a considerable amount of time during the voyages of the fleet.

H. Clemson (Falmouth).

Assaying Gold and Silver

In order to discover if gold and silver articles contain the stated percentage of pure metal they are tested in an Assay Office. There are seven of these Offices in England. That at Chester is one of the oldest. It dates from the 16th Century, and I thoroughly enjoyed a visit to see how assaying is carried on there.

If a silver article is to be assayed, a little of the metal is scraped off before polishing. A part of this sample is very carefully weighed by means of a very delicate balance, and is placed in a lead foil bag, which is then rolled up into a ball. The ball is placed in one compartment of a tray that is divided into 60 small sections. The remaining compartments are filled with other samples, each carefully ticketed, and the tray is then taken to the furnace room.

The furnace now used is gas-heated and is made of fireclay. In it are placed slabs made of compressed bone ash. These are called cupels, and on each are six hollows large enough to accommodate a shilling.

One of the balls of lead foil containing the samples of silver is placed in each hollow and the cupels are then strongly heated in the furnace. The lead melts and is oxidised to litharge, or lead oxide, which is absorbed by the porous bone ash, carrying with it oxides of other metals, only silver being left in a metallic condition. At the end of the process all that can be seen is a little button of pure silver in each hollow. Each button is brushed and weighed, and by comparing its weight with that of the metal wrapped in the lead foil the percentage of pure silver in the article may be found.

In assaying gold articles the same procedure is followed except that a small bit of silver is placed along with the gold in the lead bag. In this case the metal left is an alloy of gold and silver. This is rolled into a strip and the silver is dissolved out by means of boiling dilute nitric acid. The little roll of gold remaining is then carefully weighed.

If an article is found to be deficient in gold or silver the assay is repeated in order to make sure that there has been no mistake and the article is then broken up. One that contains the correct proportion of precious metal is hall-marked.

W. S. Norman (Newton-by-Chester).

Books to Read

On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"The Triumph of Man in Science and Invention"

By Ellison Hawks
(T. C. & E. C. Jack. 10/6)

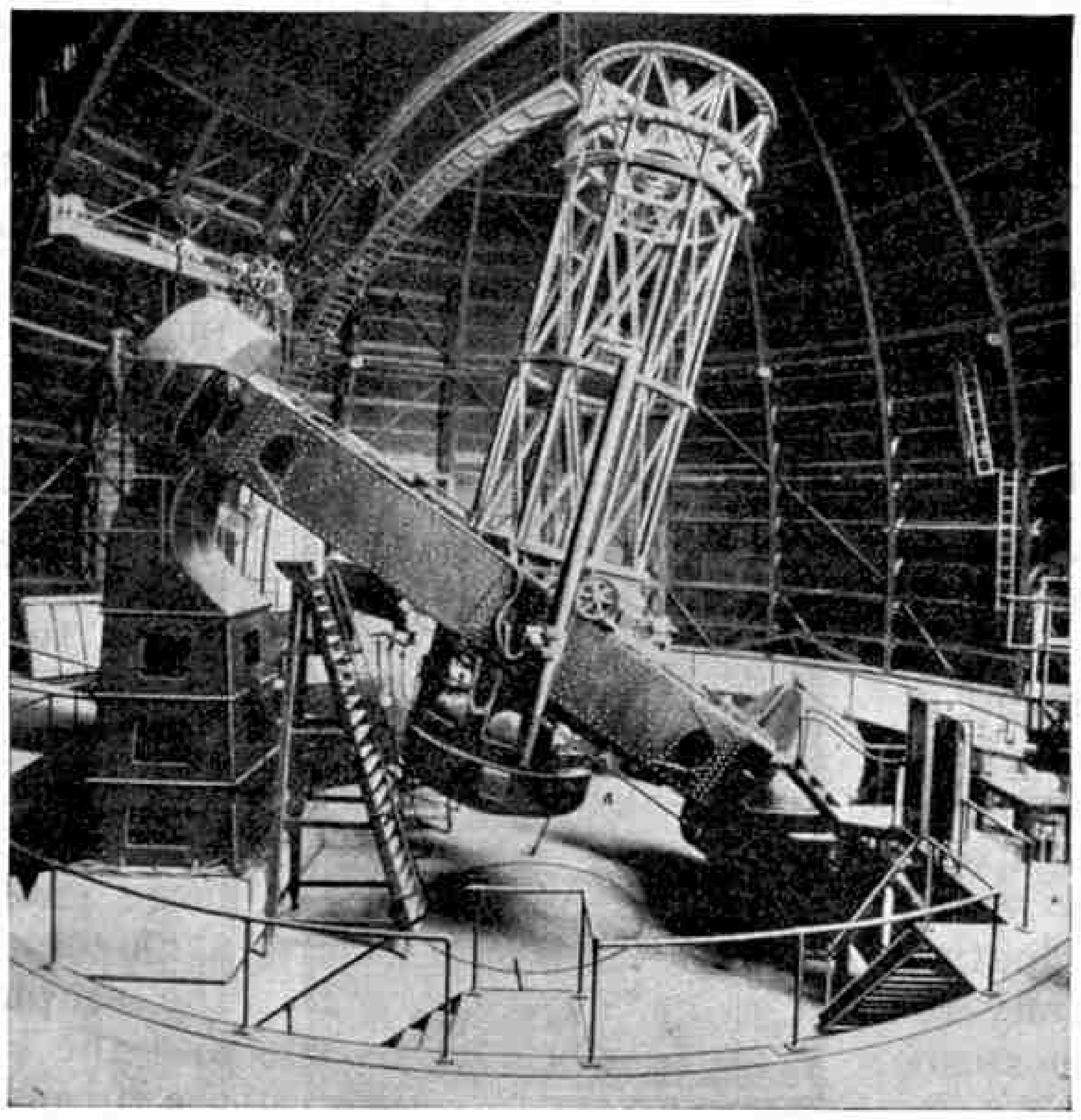
In this finely produced and excellently illustrated book, the author (who is also the Editor of the "*M.M.*") deals with the wonderful story of Man as a tool making animal. He shows how Man has slowly but surely carved his way to civilisation, and how every invention and science of importance has played its part in his ultimate triumph.

First we read how the Earth began as part of a nebula that formed a group of heavenly bodies—the solar system—of which the Sun is the core and the planets are the offshoots. We learn that the Earth is made up of fire-formed rocks (granite), water-deposited or sedimentary rocks (limestone), and metamorphic rocks formed by heat and pressure. In the course of time all these constituents of the Earth, even the hardest rocks, have been worn down by rain, wind, frost and similar agencies, to form the mountain ranges and the valleys of to-day. Even now changes are still taking place in the interior of the Earth, and the raging forces of the huge furnace that is the world's heart, vent themselves as earthquakes in definite areas. The rocks are the pages of the Earth's history and to those who can read them they tell a wonderful story of life in the past.

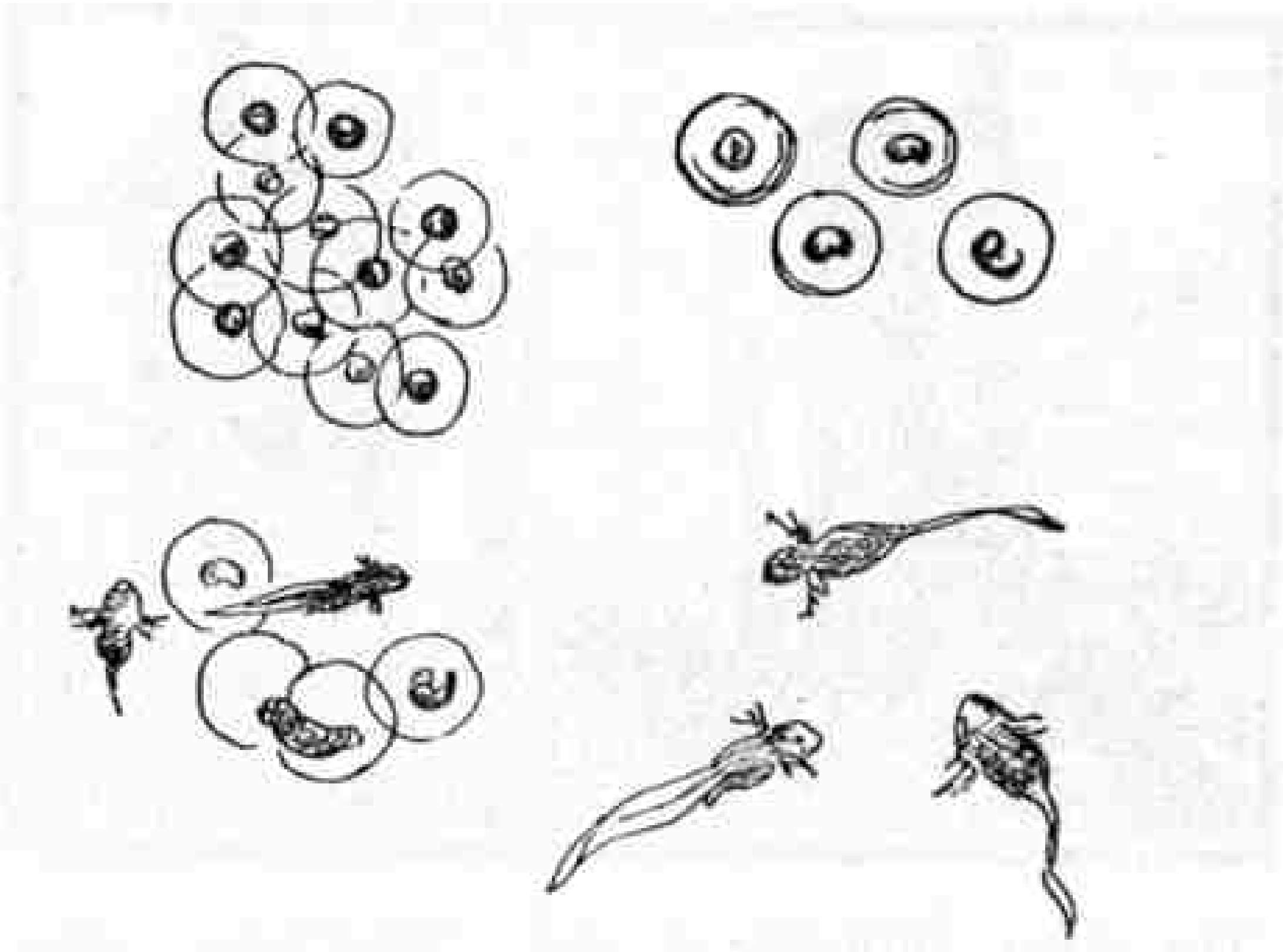
Man, who came at a comparatively recent date, differs in many respects from all other creatures with his divine faculty of mind. He conquered even the fiercest of his animal rivals by wit and weapon; he made an alphabet from the natural sounds of his life; he made his first tools by chipping flints in the days when tigers roamed in Devon and lions lived in the Mendips; he hunted with his flint-tipped arrows and spears when what are now the Tyne, the Humber, and the Thames were all tributaries of one great river long since lost. Then he learned to make hammers and chisels, and many other implements such as have been discovered in a Stone Age workshop unearthed in Bedfordshire.

Signs of the mastery of fire occur at an early date, and the spit and cooking pots followed as a matter of course. Life widened out considerably with the discovery of bronze, for the bronze axe made it possible for forests to be cleared and land to be cultivated.

Civilisation dawned when Man's house passed from tree and cave to dug-out and hut, and we are told the fascinating story of the house—which at first was made of boughs covered with mud or clay, and later of timber and wattle. The making of bricks gave a new permanency to houses, and we learn that although the Greeks built fine temples they had but inferior houses, and that the Romans perfected the house by adding sanitation and water systems. To-day the building, heating, lighting and ventilating of our homes have become fine arts. In Britain wattle was in common use until the coming of the Romans, who preferred bricks and timber for their British homes. Stone as a building material came into use in the seventh Century and in Norman days its use was common. Wood and plaster, which had come into favour again, finally passed with the Great Fire of 1666, after which brick houses grew in number and size.



The 100 in. reflecting telescope of the Mount Wilson Observatory, by which wonderful discoveries have been made in the heavens. One of the illustrations from the "Triumph of Man" reviewed on this page.



Stages in the development of the frog. See opposite page.

Turning from the story of the house to that of food, we find that Man the hunter later became Man the herdsman and farmer. To-day, the inventor and the chemist have become the ally of the agriculturalist. The former contributes the tractor and the reaper and a score of other machines, which make the shortage of labour less serious; the latter combats plant diseases and by his efforts increases fertility. The scientist and inventor even defeat the seasons and save waste of food by chilling and freezing. (In one cold storage in Liverpool two million carcases of lamb and mutton and over a quarter million sides of beef, in addition to a host of other commodities, can be kept indefinitely in good condition).

Then there is the fascinating story of our clothes—from the time they were made of skins down to the artificial silk garments of to-day. We read of the passing of the loin cloth in favour of tunic and toga, and of the coming of breeches and the smock—all of which went to make a pageant of dress at a time when every man was known by the clothes he wore. The "spinning jenny," the Mule spinning frame, and the automatic loom revolutionised these crafts—and, incidentally, the advent of this machinery nearly caused a revolution. The dyeing and the dye industry are fully dealt with, as are a hundred and one other inventions and discoveries.

To describe fully the remaining wonders of this book would require several pages. Mr. Ellison Hawks has given us a masterly survey of the work done by the telescope and the microscope. He tells the story of the measurement of time from the crude sundial to the modern chronometer; of writing and printing from the time when the alphabet was made to the latest Hoe press; of telegraphy and telephony; of electricity; of steam; of coal products; of transport on land, sea and air; and—last but not least—the wonderful story of Man's conquest of disease.

If the facts written in this book reveal Man's triumph in science and invention, the volume surely reveals the triumph of the author in presenting this vast array of material in such an interesting and lucid manner—but as all "*M.M.*" readers know, the Editor is fully capable of doing that!

The undersigned does feel that *this book is wonderful* and he knows that it will long be prized by men and the sons of men for the many fine things it contains.

(Rev.) J. Henry Martin.

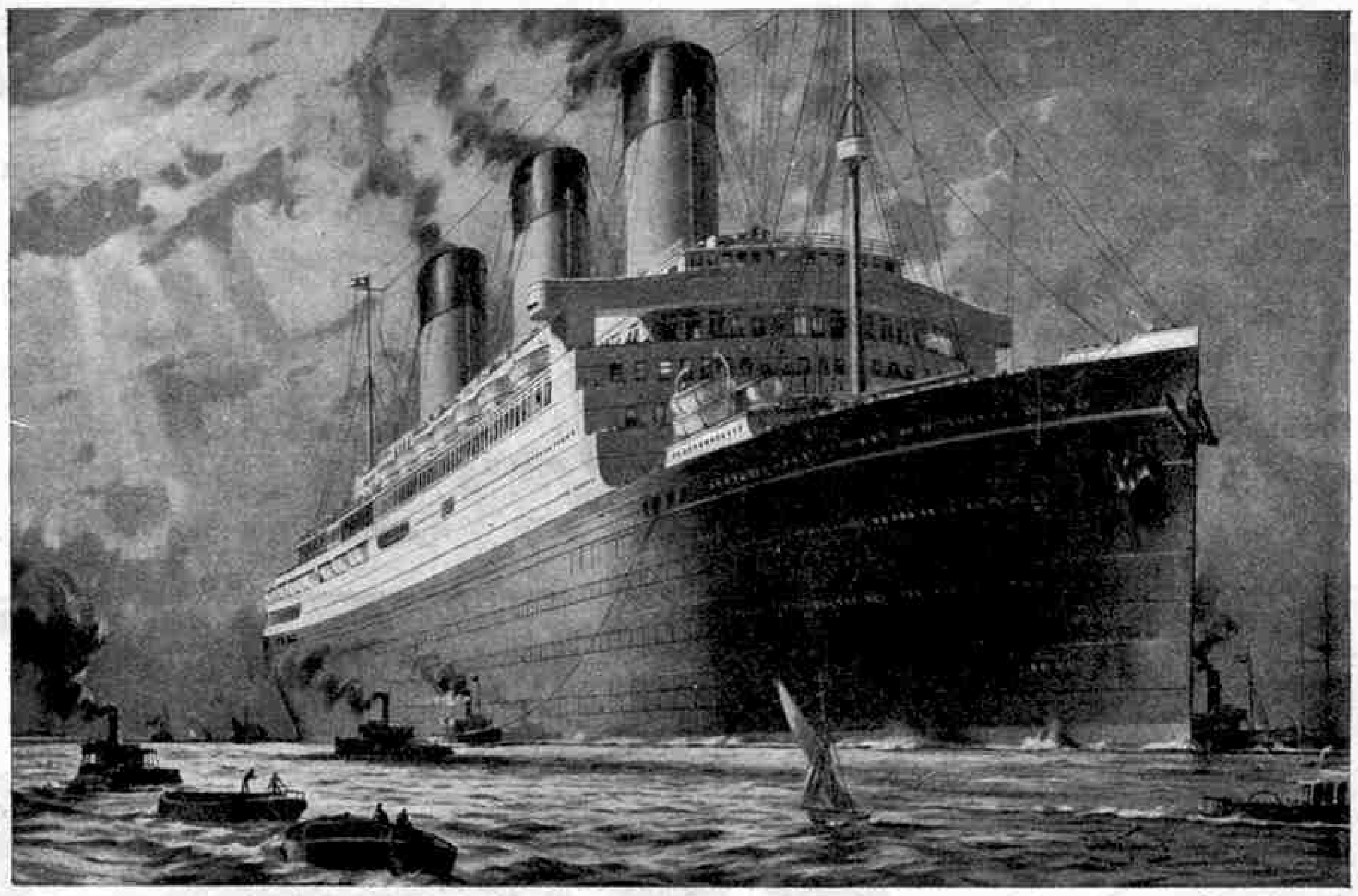
"Robin Hood"

By E. C. Vivian. (Ward, Lock & Co. 6/-)

For centuries Robin Hood has been a typical British hero, and there is not a boy or girl who will not be glad to know more of the gallant outlaw. Robin Hood was, in the true sense of the word, a gentleman, and although hard and stern to his enemies, he could be as gentle as any woman, and at all times he befriended the poor and needy. His adventures, and those of his merry band under the greenwood tree, are thrilling and they are told in this book by a well-known novelist. There are 48 colour plates, beautifully executed, to enhance the pages of the book, which boys and girls of all ages will read with delight.

Robin Hood was an adventurous kind of man, even in his youth and at an early age he knew all the intricacies of Sherwood Forest, which stretched from the neighbourhood of Nottingham towards the little collection of huts that stood where Sheffield is to-day. Here, Robin and his band were safe, and he became a friend of the poor and because he hated injustice he made many friends.

The stories of the famous outlaw are to be found in the old ballads, and although some of them contradict others, the greater part of them fix the date of his outlawry as being in the reign of King Richard Lion Heart, who, when he went off to the Crusades in the Holy Land, left England in charge of his bad brother John. Robin had gathered his band in the Midlands, where there were many Saxon families who hated the Normans as conquerors and oppressors, for they ruled their Saxon subjects by fear. John was not only bad, but weak as well, and yielded to his favourite nobles. All over the country great castles were built, and in his introduction Mr. Vivian tells us that most of these castles were no better than nests of robbers. Most of the barons had power of life and death on their own estates, and many of them oppressed the people, regardless of right or justice. This was the state of things when Robin Hood was young, and the book tells us of his many adventures in the cause of freeing his countrymen from the tyranny of their oppressors.



The White Star Liner "Majestic," the largest ship in the world, which sometimes has been described as a floating city. From "The Triumph of Man" reviewed on the previous page.

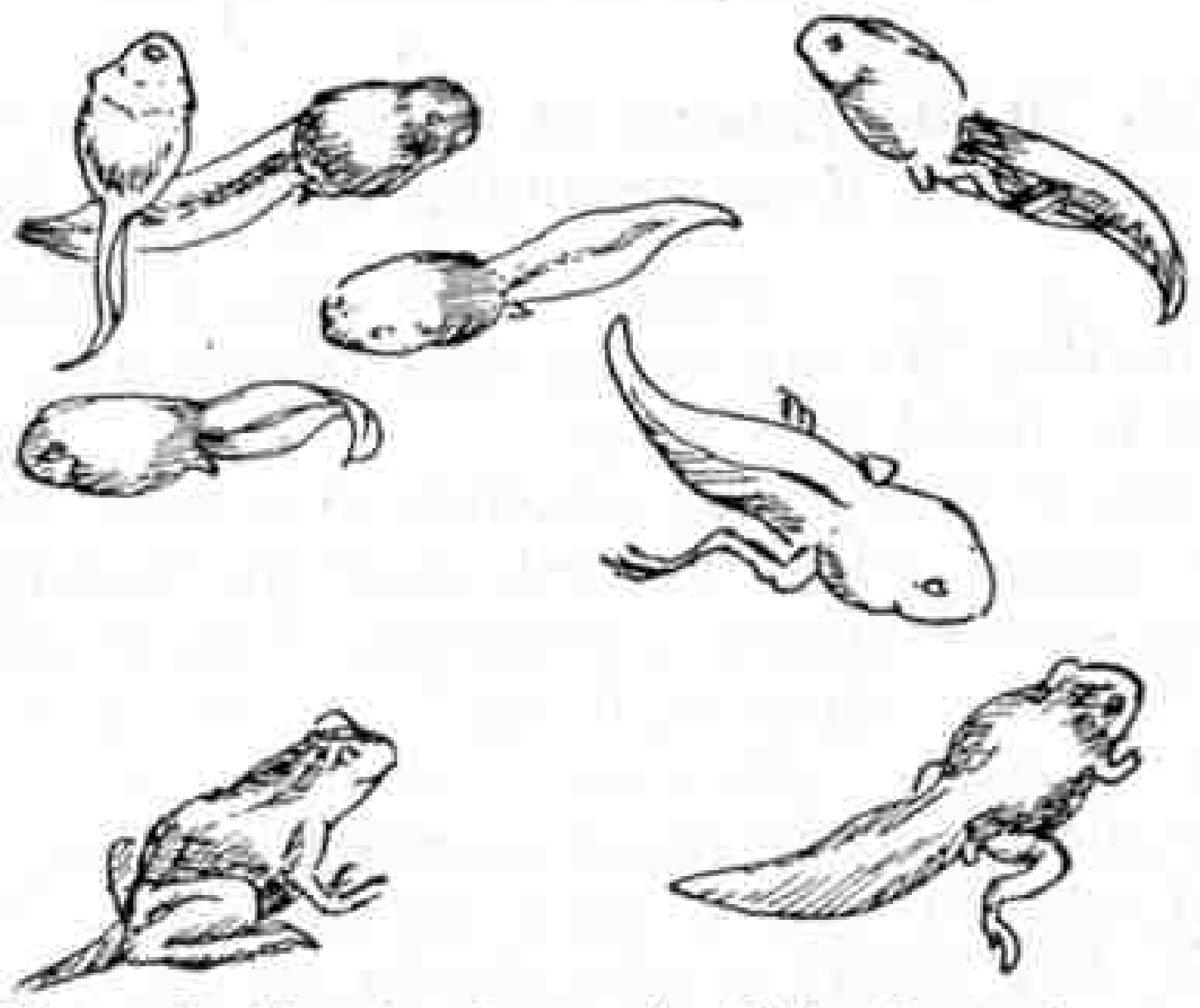
"Living Creatures"

By C. Von Wyss. (Black. 12/6)

In his foreword, Professor J. Arthur Thomson correctly describes these studies of animal and plant life as masterly and of high value, not only for their carefully-worked out and personally discovered material but also because they suggest many ways in which one can learn more about Nature.

At this time of the year the book will be of great interest to all those who are in touch with outdoor Nature, and to the "pond-dipper" a large section of the book will be of particular value.

We illustrate on these pages typical drawings showing the development of the frog, from the gelatinous covered egg to the fully-developed tadpole. We learn that the female frog lays between one and two thousand eggs, which are from two to three m.m. in diameter. The development of the tiny creature in the egg continues steadily for a fortnight, when the little tadpole may be seen to move vigorously within its gelatinous covering. After a few days the mouth appears and about the fourth or fifth week, when the tadpole is about 1 in. in length, it swims vigorously about by movements of its tail. In the course of the seventh week the rudimentary hind limbs appear at the base of the tail and gradually develop toes in the course of the next ten or twelve days. When the tadpole is about three months old its whole anatomy and its manner of living undergo interesting changes. Whereas so far it has lived upon dead vegetable and animal matter, its food from this stage consists of living insects and worms. Soon the changes are complete and the tadpole enters upon its adult life as a frog, gradually leaving the water and spending the greater part of its life on land.



Stages in the development of the frog, shown slightly reduced. One of the illustrations from "Living Creatures" reviewed on this page.

All this—and very much more—is explained in a clear and interesting manner, in regard to the common animals and plants of the country, and many of the subjects are treated in considerable detail, the authoress evidently having a keen delight in Nature and a great desire to understand her ways. We find much useful information about toads and newts; cadis, dragon, alder and many other flies. Water beetles and spiders; beetles and snails; ants, bees, and wasps; frog hoppers and lady birds; flowers, fruits and trees—in fact a veritable mine of information for the Nature student.

The book is illustrated by a number of sketches and is well indexed.

"Holiday Haunts"

The familiar Great Western Railway publication *"Holiday Haunts,"* this year makes its 25th annual appearance and attains to over 1,000 pages. Although it follows the lines of previous editions, it has been largely re-written, and it forms a complete and up-to-date guide to the whole of the places of interest served by the G.W.R. The summaries of the various places give just the kind of information required by those seeking new holiday grounds, and the excellent illustrations, which are lavishly provided, are exceedingly helpful. The publication gives some thousands of addresses of hotels, boarding houses and private apartments, and useful general information for travellers.

"Holiday Haunts" may be obtained, price 6d., at all G.W.R. stations, agencies, and bookstalls, or it will be sent by the Superintendent of the Line, Great Western Railway, Paddington Station, London, W.2, upon application accompanied by a remittance.

"The Wireless Manual"

By Captain Jack Frost
(Sir I. Pitman & Sons Ltd. 5/-)

Many readers of the *"M.M."* write to the Editor asking him to recommend a book that gives an easily understood account of wireless receivers, and the principles on which they work. Captain Frost's manual "fills the bill" admirably. It is well illustrated and will be specially interesting to wireless enthusiasts of a practical turn of mind.

The author first explains what wireless is, and gives practical advice on the purchase of sets and the erection of aerials. He then describes simply but clearly the purpose of every component part usually employed in crystal or valve sets. Special chapters are devoted to the important topics of the care of the set and of tracing troubles that may arise, and the list of "Don'ts" will be found particularly useful by those who desire to keep their sets in the best working order.

Interesting New Books

"The Book of the Airship"
by G. G. Jackson.
(Sampson Low, Marston & Co. Ltd. 6/-)

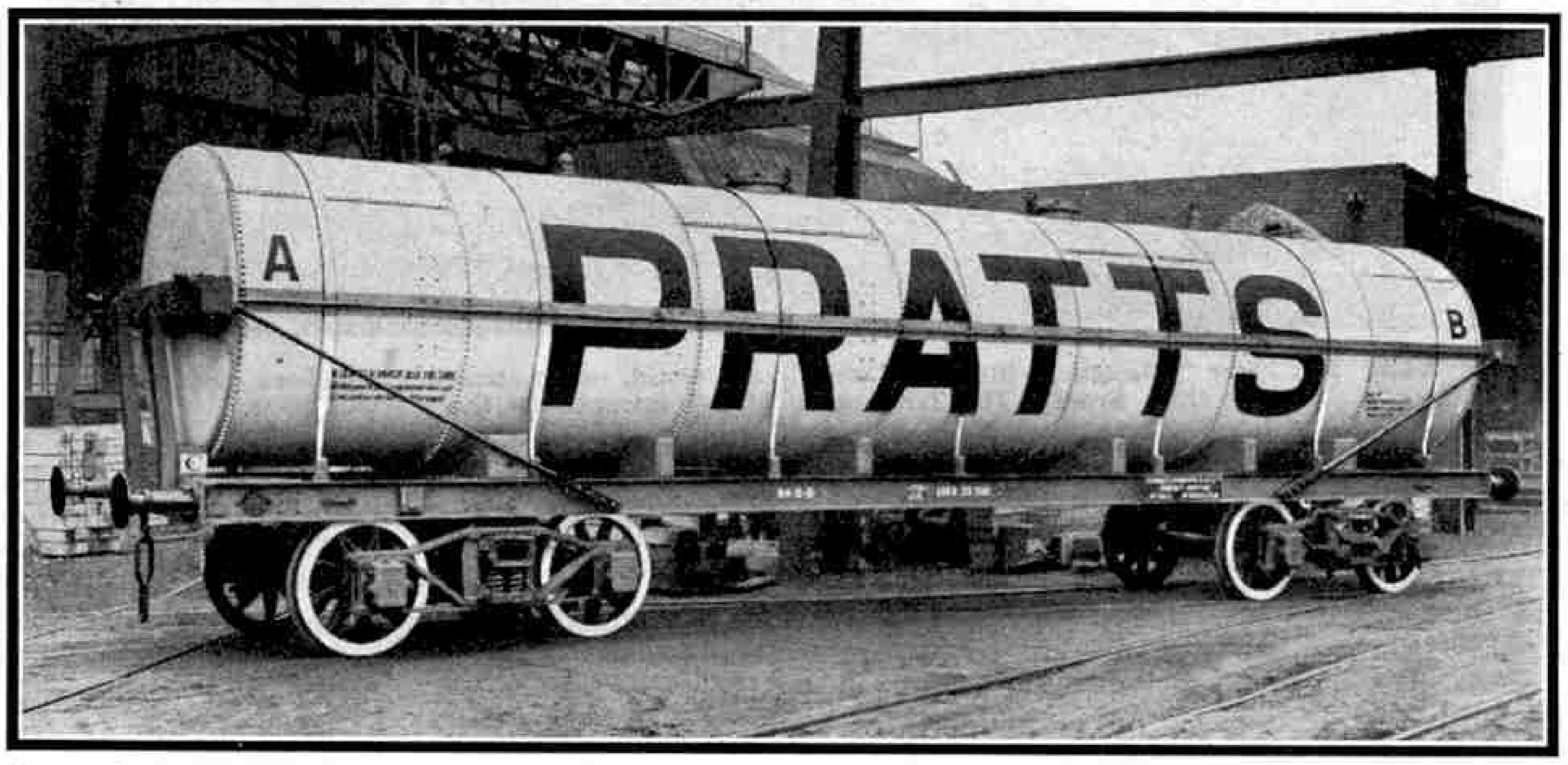
"More Heroes of Modern Adventure"
by Bridges and Tiltman.
(G. G. Harrap & Co. Ltd. 7/6)

RAILWAY NEWS

New Giant Rail Tank Car

Following on the increased demands for their products the Anglo-American Oil Co. Ltd., have found it necessary to overhaul and extend the whole of their transport system. Among the improvements effected is the introduction of the gigantic rail tank car illustrated on this page. This has a carrying capacity of 35 tons, or over 10,000 gallons of petrol.

The car was designed and made by Messrs. Charles Roberts & Co. Ltd., Wakefield, and is used for the transport of Pratt's High Test Spirit from the ocean installations, where supplies of spirit are received from ocean-going tankers, to the inland distributing depots, from which supplies are distributed to garages.



Courtesy] [Anglo-American Oil Co. Ltd.

Giant rail tank car that holds 10,000 gallons of petrol. This has been constructed for the transport of petrol from receiving depots to distributors.

The Rhubarb Express

The Rhubarb Express leaves Leeds every evening at 8.30 from early in January until about the end of March. Each of the wagons of which it is composed holds 10 tons of the rhubarb. This must be on sale in the London market in the early hours of next morning and it is therefore transported in a special goods express, the wagons of which are fitted with vacuum brakes. The track is kept clear for its passage and it arrives in London promptly at 3.10 a.m.

The district round Leeds is famous for the high quality of the rhubarb produced. No fewer than 10,000 acres of land are devoted to its cultivation, and it is forced for the early market in long sheds that have no windows. The sticks are picked by hand, packed in bags and rushed to the siding for shipment to London.

Ferro-Concrete Brake Van for L.N.E.R.

An interesting experiment has been made by Mr. H. N. Gresley, C.B.E., the Chief Mechanical Engineer, who has had a 20-ton goods brake van constructed with a body of ferro-concrete instead of wood. The weight of the concrete is sufficient to obtain the full tare without the addition of the usual cast-iron ballast weights that are fitted in goods brake vans of ordinary construction.

G.W.R. Locomotive News

The order for eighty express passenger engines of the 4–6–0 " Hall " class has now been completed at Swindon. The last of the series are numbered and named as follows :—No. 4972 " *St. Brides Hall*," No. 4973, " *Sweeney Hall* " ; No. 4974, " *Talgarth Hall* " ; No. 4975, " *Umberslade Hall* " ; No. 4976, " *Warfield Hall* " ; No. 4977, " *Watcombe Hall* " ; No. 4978, " *Westwood Hall* " ; No. 4979, " *Wootton Hall* " ; No. 4980, " *Wrottesley Hall.*" A further 20 engines of this type are to be put in hand this year.

Ten 0–6–0 goods engines of a new class are now being turned out at Swindon. They have inside cylinders, 5 ft. wheels, a " Castle " type cab, and are fitted with the audible electrical system of cab-signalling. They have a smart appearance and should prove very serviceable. The first, No. 2251, is already in service.

New tank engines include 2–6–2T No. 5150 and 0–6–0T Nos. 5788-9 constructed at Swindon ; and 0–6–0T Nos. 7737-40 and 7700 built by outside firms.

The first five of the new batch of 4–6–0 express passenger locomotives of the " King " class are now in process of erecting at Swindon. Engine No. 4040 " *Queen Boadicea*," has been fitted with " Castle " type cylinders and outside steam pipes. Another engine of this class, No. 4002, " *Evening Star*," has recently been fitted with a novel arrangement of steam pipes to the outside cylinders. Steam admission to these cylinders is, as formerly, from inside the frames, but elbows similar to those on the " Castle " class have now been fitted.

Elephant that Shunted 360-ton Train

One of the most remarkable special trains in the world is the " Circus Train," in which Wirth's Circus and Menagerie is transported from place to place in Australia. This provides accommodation for nine elephants, 34 horses, and the lions, leopards, bears and other animals of the extensive menagerie, in addition to more than 100 employees and the tents and baggage of the company. The total weight thus transported is 130 tons.

In making up the train, finding accommodation for the elephants proved the greatest difficulty, and it was necessary to raise the roofs and strengthen the floors of the two trucks provided for them. These animals are not ungrateful for the efforts made on their behalf, however, and readily give assistance when heavy work is called for. One of them, an animal 96 years of age, is reported to have shunted unaided a complete train of 360 tons !

In the " *Victorian Railway Magazine* " an amusing story is told of one elephant that used its strength too well. The driver of the " Circus Train " asked for the loan of one of these creatures in order to push a locomotive round on a turntable. He was allowed to lead the elephant away and when posted in position, the animal pushed with its head and soon had the turntable moving round at a reasonably high speed. Unfortunately the engine driver forgot the magic word that would cause the elephant to cease its efforts ! The sagacious animal transformed the turntable into a regular merry-go-round, and not until half-an-hour later was the trainer of the animal found, and the performance brought to an end.

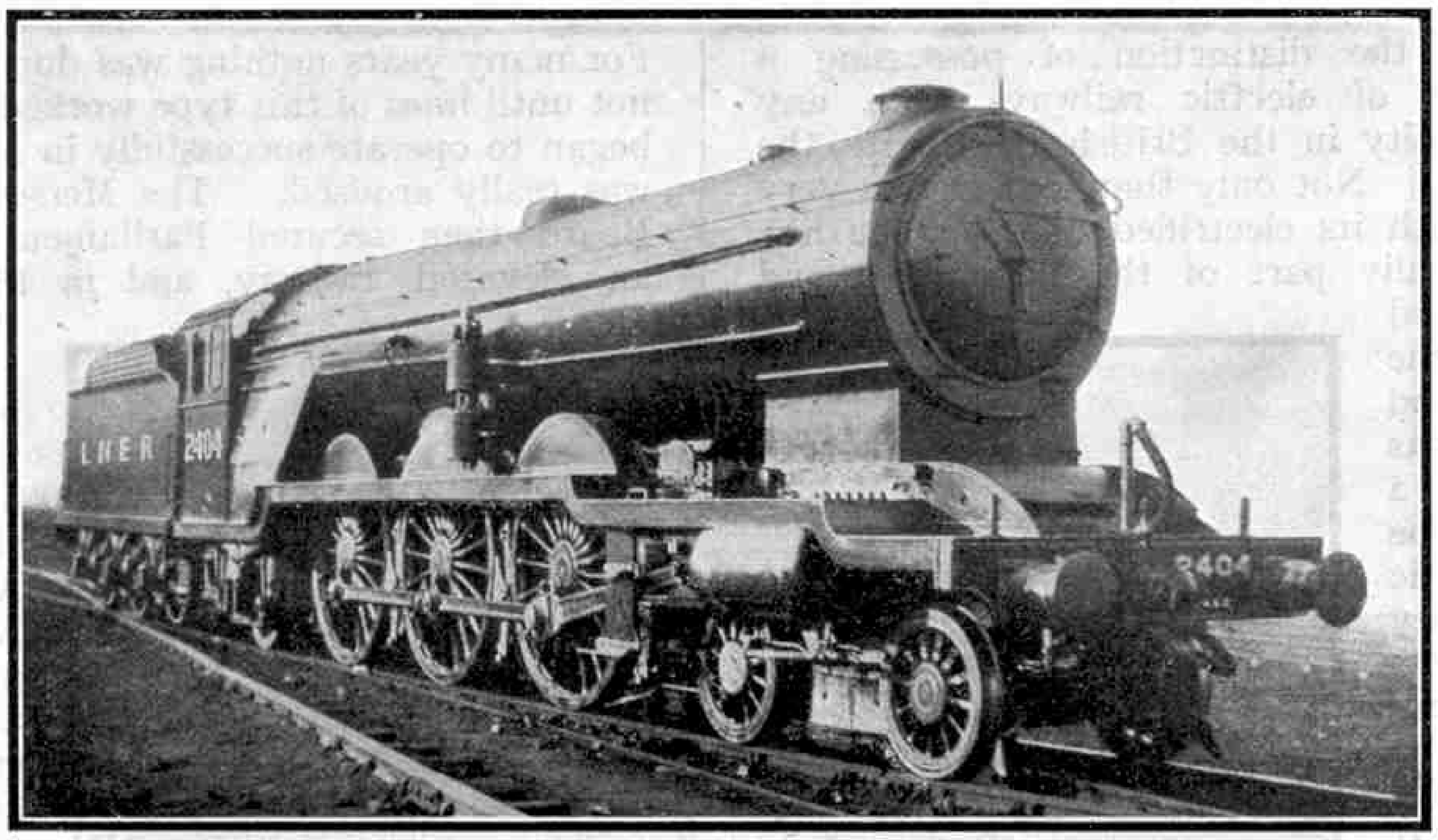
Traffic on the Train Ferries

High capacity wagons of many unusual types may be seen daily on the Harwich-Zeebrugge train-ferry steamers. They include Belgian covered trucks 25 feet in length, and enormous motor-car wagons from Italy that are nearly 19 ft. longer, in addition to 43¾ ft. German flat open wagons with stanchions.

More Special Trucks for G.W.R.

The G.W.R. announce that as a result of increasing demand 100 special trucks are to be built at their Swindon works for the conveyance of new motor cars from manufacturers' works at Birmingham and Oxford to all parts of the country and also to seaports for export.

The Company now have 518 covered and insulated containers in daily use. Their introduction has been very successful, the tonnage carried in them during 1929 being 211 per cent. more than that of the previous year. Their number is to be increased by the construction of 50 covered containers and 25 of the insulated type.



L.N.E.R. "Pacific" locomotive No. 2404, "*City of Ripon*." This has been fitted with a Gresley tapered boiler, and working pressure is reduced from 200 lb. to 180 lb. per sq. in. This photograph was taken by our reader C. M. Furst, Joppa, Midlothian.

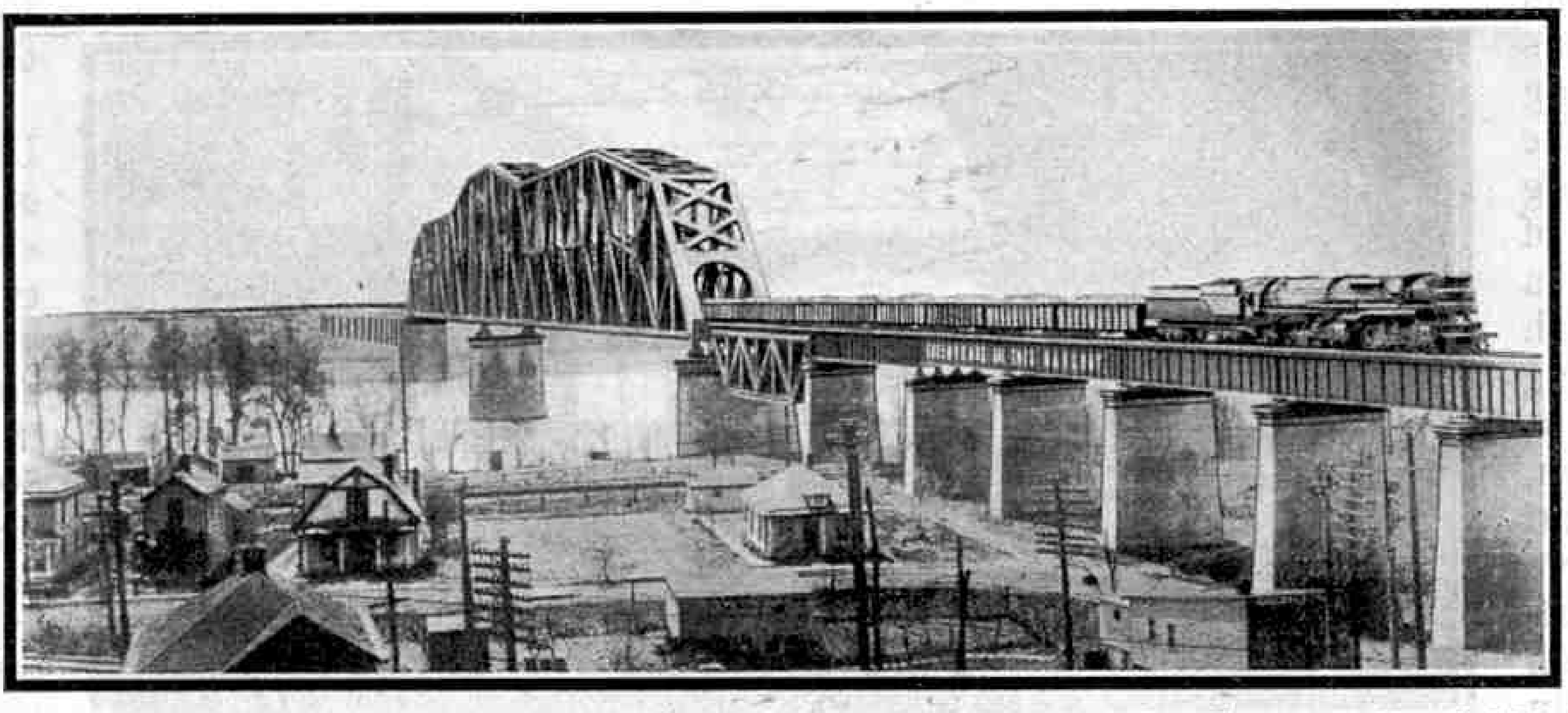
L.M.S. Locomotive News

Twenty more 4–6–0 express engines of the "Royal Scot" type are to be put in hand immediately. They are to be built at Derby, but the boilers and cylinders will be made at Crewe.

In recent months several "Royal Scot" engines have worked through from Crewe to Perth and back.

The first ten, numbered 13150 to 13159, of the new series of 2–6–0 mixed traffic engines now being turned out at Crewe are allocated for work on the Western division (L.N.W. section).

Locomotive No. 9095, one of the 0–8–0 "G" class, has been converted to the superheated "G1" class. Nos. 8453 and 8555, 0–6–0 goods engines with 18 in. cylinders, have been fitted with raised footplates and enlarged tenders.



A Class H-7-A locomotive of the Chesapeake & Ohio Railway hauling a train of 132 loaded cars.

New Trains for South Wales Services

Two new trains are being constructed by the G.W.R. for use on the London and South Wales services during the coming summer. As they will consist of the latest stock 9 ft. 7 in. in width, certain alterations are being made at Llanelly in order to afford the necessary clearances between the coaches and certain lineside structures.

Saving 100,000 Tons of Coal

A shovelful of coal saved every 10 miles would amount to a saving in coal of about 100,000 tons yearly on L.M.S. engines! This remarkable fact is announced on a striking poster that is being exhibited at all locomotive depots on the L.M.S. It is further pointed out that drivers and firemen can help by using the valve gear to best advantage; by not blowing off at the safety valves; by not making smoke; and by arriving at the shed with as low a fire as possible.

S.R. "School" Class Locomotives

The first of the eagerly-awaited 4–4–0 express engines of the "School" class has now been completed at Eastleigh. It is numbered 900 and named "*Eton*." It has three cylinders of dimensions 16½ in. by 26 in., and the diameter of the coupled wheels is 6 ft. 7 in. The other nine engines of this class that are building are to bear the following names:—"*Winchester*," "*Wellington*," "*Charterhouse*," "*Lancing*," "*Tonbridge*," "*Sherborne*," "*Dulwich*," "*Westminster*," and "*St. Paul's*."

New Monster Locomotive for the C.P.R.

In last month's "*Meccano Magazine*" a description and an illustration were given of one of the giant 2–10–4 locomotives of the "5900" series that have recently been put into service on the C.P.R. These are claimed to be the largest in the British Empire. Plans are now in hand for the construction at the C.P.R. shops at Montreal of a still more powerful locomotive, however. It will have the same wheel arrangement as the "5900" class, but the tractive effort will be increased by 5,200 lb. to 83,000 lb., and the total weight of engine and tender will be more than 340 tons. It is to have a multiple pressure boiler and steam at 850 lb. pressure will be used in one cylinder.

Building Programme of L.N.E.R.

Two more engines of the J39 class of 0–6–0 goods engines have been completed at Darlington and are numbered 1466 and 1470. Nine 2–6–0 engines are now building there.

At Doncaster, further 2–6–0 engines—Nos. 1396–8—have been built and sent to work in the North Eastern area. Some 2–6–2 tank engines are now in hand and are intended for service in the Scottish area.

It is now possible to give fuller particulars of the engine-building programme for the present year. The locomotives to be built total 144. No "Pacifics" are included in it, however, as it is thought that those already in service are equal to all present requirements. The largest passenger engines in the programme are fifteen of the 4–6–0 "Sandringham" type, similar to those at present working the principal expresses between Liverpool Street and the Eastern Counties. When these new engines are put into service, it is intended to transfer several of the older 4–6–0 engines of the G.E. type to the Great North of Scotland section to work the expresses between Aberdeen and Elgin. This will provide the additional power that is needed for these trains and avoid double-heading.

Fifteen "Shire" class engines for use on express passenger trains in the North of England are also included in the programme, and, in addition to these, 26 side-tank engines of the 3-cylinder 2–6–2 class; five of these are for use in the Eastern Counties, Lincolnshire and the Midlands and the rest are for work in Scotland.

The remaining engines consist of 14 K3 class 2–6–0 three-cylinder fast goods engines for use in all parts of England; 15 three-cylinder 2–8–0 mineral engines for use in the Southern districts; 35 standard six-wheeled coupled engines of the J39 class for use on all L.N.E.R. lines; 20 standard small shunting engines of the 0–6–0 J72 type; two 2–8–2 side-tank engines and two 0–8–4 class S1 side-tank engines for shunting purposes.

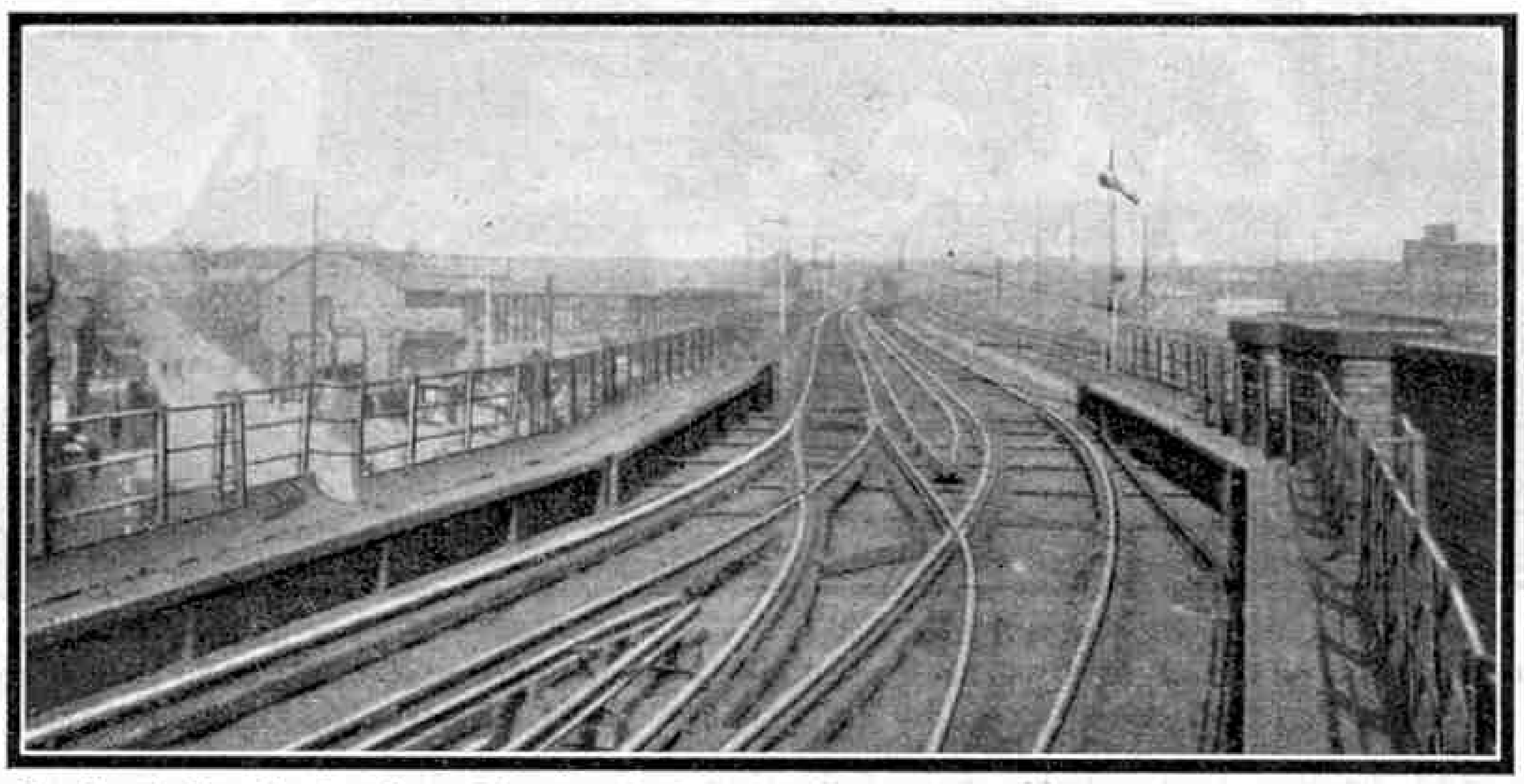
A new 200 h.p. steam rail coach has recently been undergoing trials in Yorkshire. The car weighs 47 tons and is propelled by two standard six-cylinder single-acting Sentinel engines, and a boiler of the water tube type. It is intended to place a car of this description at Guisborough, North Yorkshire, in substitution for the steam trains that are at present in use.

The Three Electric Railways of Liverpool

I.—The Overhead Railway

By R. D. Gauld, M.Eng., A.M.Inst.C.E.

LIVERPOOL has the distinction of possessing a greater mileage of electric railways than any other town or city in the British Isles, with the exception of London. Not only that, but it was very early in the field with its electrified lines. The line to Southport, originally part of the Lancashire and Yorkshire Railway and now a section of the London, Midland and Scottish Railway, was the first portion of a main line railway to be converted to electric traction. The Mersey Railway, which connects Liverpool and Birkenhead by means of a tunnel beneath the Mersey, was worked at first by steam locomotives and converted to electric operation in the early days of electric trains. The Overhead Railway, with which we are now particularly concerned, was the first electrically-operated overhead railway in the world, and it is still the only one of its kind in the British Isles.



Seaforth Sands Station, Liverpool Overhead Railway, looking toward Seaforth, where the line joins the L.M.S. Liverpool-Southport route.

In order to understand the reason for the existence of the Liverpool Overhead Railway it is necessary to visualise a line of docks practically continuous for seven miles along the east bank of the River Mersey. Along the landward side of the docks there is a wide roadway, with branch roads leading from it into the various docks. In addition, the Mersey Docks and Harbour Board have their own very extensive railway system running along the main dock road and serving the docks, being connected at various places with goods yards belonging to the L.M.S. and L.N.E. railways. As a result of this extensive dock development there arose the problem of supplying facilities to enable passengers to travel conveniently from the various docks to the north end, the south end, or the centre of the city, while at the same time causing no interference with the free flow of the very heavy goods traffic by road and rail along the docks, which is a matter of the highest importance.

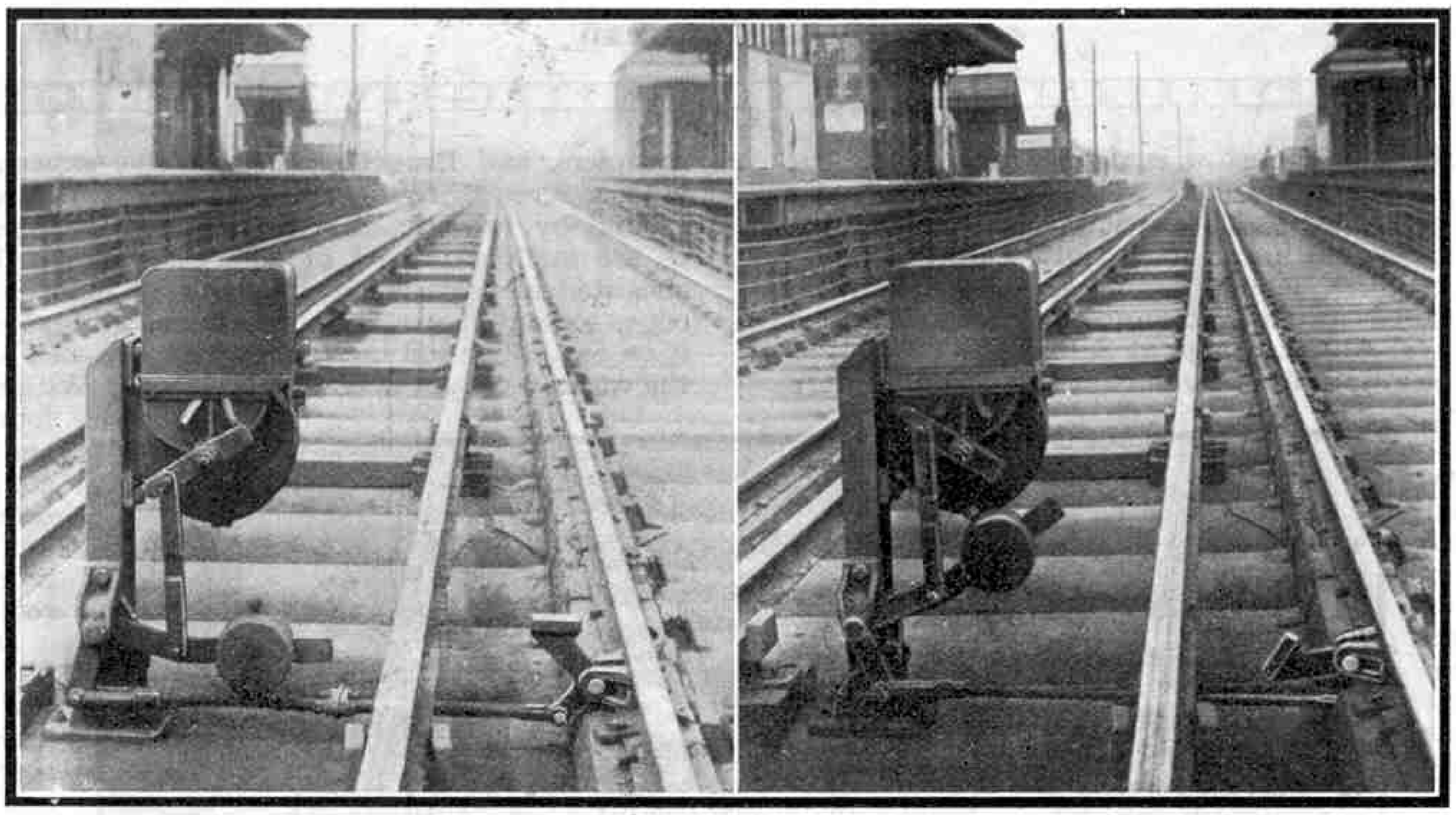
Interior of Pier Head Station, on the Liverpool Overhead Railway.

As far back as 1852 it was proposed to solve this problem by the construction of a high level railway. For many years nothing was done, however, and it was not until lines of this type worked by steam locomotives began to operate successfully in New York that interest was really aroused. The Mersey Docks and Harbour Board then secured Parliamentary powers to build an elevated railway, and in 1888 the promotors of the Liverpool Overhead Railway took over these powers and commenced the construction of the line. Prominent among the promoters were Mr. A. G. Lyster and Mr. Alfred Holt, who bear names well known in Liverpool; and the engineers were Sir Douglas Fox and Mr. J. H. Greathead, the latter being the pioneer of London Tube construction.

The line was opened by Lord Salisbury on 4th February, 1893, at which time it had fourteen stations. It was extended north to Seaforth Sands in 1894; south to Dingle in 1896; and north to a junction with the Lancashire and Yorkshire Railway, now the L.M.S., at Seaforth in 1905. The railway now has seven miles of double track and owns one steam locomotive and more than 40 electric cars.

At the south or Dingle end the line is in rock tunnel, but elsewhere it is practically all on a steel viaduct carried on steel columns. Generally these columns are spaced 50 ft. apart, but in some instances they are as close as 30 ft. and in others are separated by as much as 98 ft. For these long spans bowstring lattice girders are used to carry the track, but for the usual spans I section girders are used, the underside being 16 ft. above the road. Near the Bramley Moore Dock the railway dips down on an embankment at 1 in 40 to pass under an L.M.S. coal line to the dock coal tips, rising similarly on the other side. There are no very sharp curves on the line, the sharpest being one of 396 ft. radius.

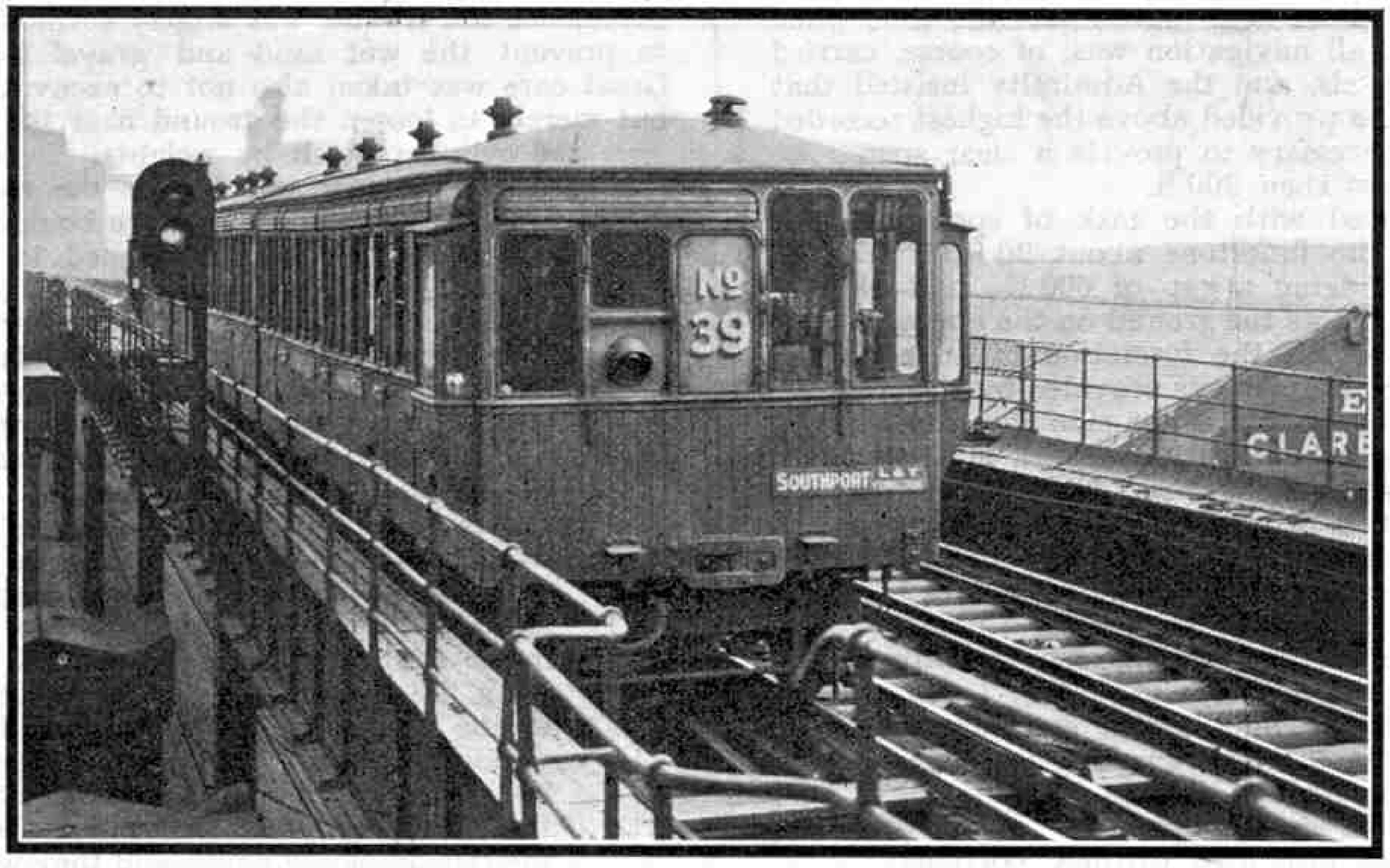
The permanent way consists of flat-bottomed steel rails weighing 60 lb. per yd., laid on longitudinal timbers held in position by lugs riveted to the floor plates of the structure. The life of these rails has been found to be about 13 years on the straight and about five years on curves. The current rail, which is charged to 500 volts, is located outside the running rails, in the space between the tracks, and is mounted on siluminite insulators. An insulated rail is not used for the return current, which passes by way of the running rails.



Courtesy] [Liverpool Overhead Railway

One of the automatic train stops on the Railway. On the left the post is shown "on," and "off" on the right.

The cars are of American design with double bogies, and each can seat 16 first-class and 41 second-class passengers. Each train, consisting of two cars, has two motors, one at each end of the train. The armatures, which are of drum type, are mounted direct on the axles; and the magnets, of the double horse-shoe type, are supported by two bearings on the axles and springs on the bogie framework. To modern ideas they are out of date, but nevertheless they are still giving very useful service. The maximum motor speed is 300 revolutions per minute, giving a train speed of 30 miles per hour. This speed is very seldom attained, however, as the stations are very close together.



Courtesy] [Liverpool Overhead Railway

A train on the Liverpool Overhead Railway. One of the day colour light signals is shown on the left.

At present the rolling stock owned by the railway consists of one steam locomotive, 42 electric motor cars, 15 trailers, and two service vehicles. Trains commence to run about six o'clock in the morning, and the services finish soon after 11 o'clock at night. The usual interval between trains is five minutes.

Originally the railway had its own power station at the Wellington Dock, so situated that the coal could be delivered direct to hoppers over the boilers, of which there were six, 8 ft. in diameter and 30 ft. in length. There were four engines, built by John Musgrave and Sons, famous as builders of mill engines. Each developed 400 h.p. and was of the horizontal compound type with "Corliss" valve gear, the action of which was very fascinating to watch. The cylinders were of 15½ in. and 31 in. diameter with a stroke of 36 in.; and the boiler pressure was 120 lb. per sq. in. Duplicate steam condensers were provided to guard against breakdown. Each pair of main engines drove, by means of 19 cotton ropes 1¼ in. in diameter, a shunt wound two pole dynamo which, rotating at 400 r.p.m., generated 475 amperes at 500 volts pressure. The current passed direct to the current rails.

This generating plant gradually became obsolete, and in order to secure greater efficiency and economy in working the power station was shut down on 26th June, 1927, and current was switched on from three sub-stations of the Liverpool Corporation.

The Electric Construction Company, of Wolverhampton, supplied the original electrical equipment, and one of the contract conditions was that they should run the line for two years at a payment of fourpence a train mile for supply of current. This worked out to their advantage, as even in 1897 the total working expenses per train mile were only 3½d.

A notable feature about this little railway when it was first opened was that it was provided with automatic signals and was almost the first of such installations. It was, of course, ideal for such working, as the trains were all the same, and ran at regular intervals and at the same speed. Crossovers were provided at intervals for emergency use in case of breakdown, but generally speaking the working was quite simple and straightforward. Track circuits were not in use in those days, so the signals were controlled by a contact-making device on the last bogie of the train. This switched an electric current on to and off the signals, which were worked by electro-magnets. The contact-makers on the track were arranged at suitable points so that a train always had at least one signal behind it at danger.

(Continued on page 294)

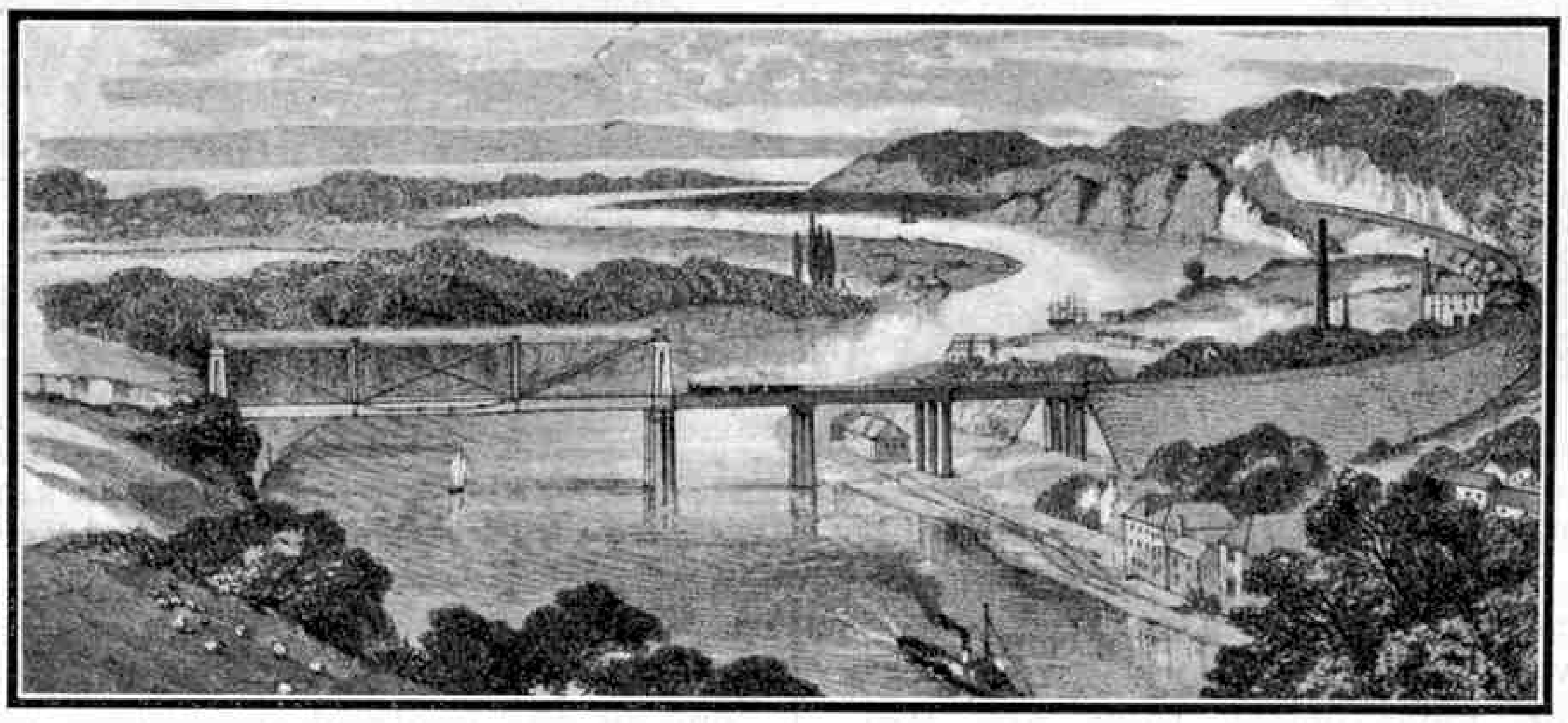
The River Wye Bridge at Chepstow

One of Brunel's Most Remarkable Structures

By E. Flaxman

THE River Wye Bridge at Chepstow is rightly regarded as one of I. K. Brunel's most remarkable works, and it illustrates admirably the great engineer's capacity for surmounting difficulties on his own original lines. It is quite certain that at Chepstow he gained a great deal of useful knowledge and experience, which he turned to good account later when engaged on the magnificent Royal Albert Bridge at Saltash.

When the South Wales Railway, now part of the Great Western Railway, was projected, it was obvious that considerable difficulty would be encountered in crossing the River Wye. The lessees of the railway do not appear to have worried unduly about the matter; they appointed Brunel as engineer and confidently left the rest to him.



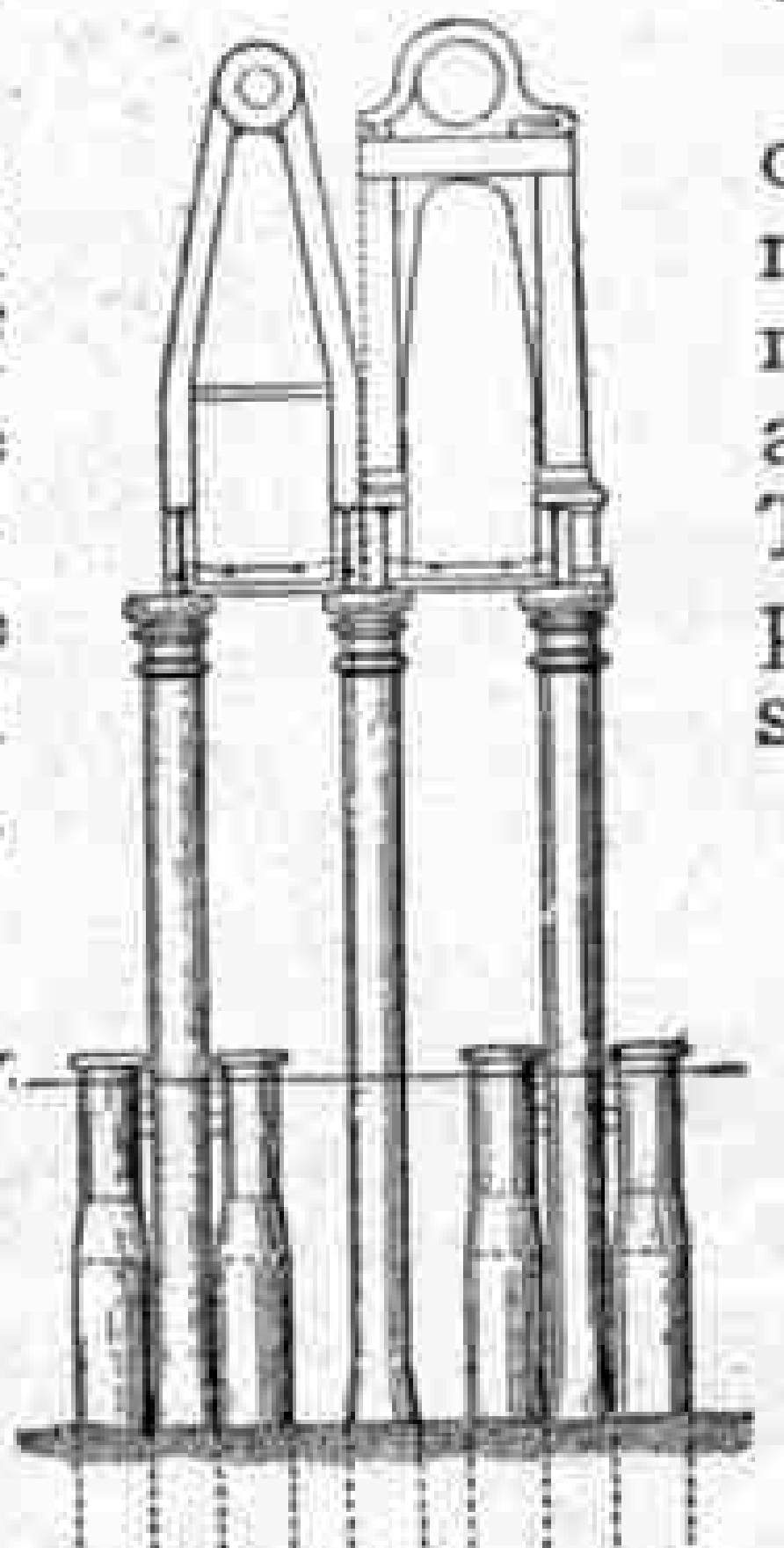
The River Wye Bridge at Chepstow as it appeared in 1852, when it was first opened for traffic. It was then on the G.W.R. main line from London to South Wales.

At the part of the river where it is now spanned by the bridge, the left bank is the edge of a broad tableland and consists of an almost sheer cliff of limestone rising to a height of 120 ft. above the river. On the opposite bank the ground is composed of clay, loose shingle and quicksand, sloping very gently upward for a considerable distance and rising only a few feet above high water. At the time when the bridge was constructed all navigation was, of course, carried on by means of sailing vessels, and the Admiralty insisted that a headway of 50 ft. should be provided above the highest recorded tide. In addition it was necessary to provide a clear span over mid-channel of not less than 300 ft.

Brunel therefore was faced with the task of springing his structure direct from the limestone about 20 ft. from the top of the cliff and bridging a gap of 600 ft., half of which must be in one span, before the ground on the opposite side was high enough to permit the formation of an embankment. At one end a secure pier was provided by Nature in the form of the cliff, but on the other side the ground was very soft and water-logged. Borings showed, however, that solid rock existed at a depth of about 30 ft. below the bed of the river, but this meant some 84 ft. below high water; moreover, the rock sloped at an angle of 45 degrees. An additional complicating factor was that the River Wye at Chepstow is subject to "bore" tides from the much wider Severn, which rush up with great force and sometimes rise as much as 53 ft.

In view of these difficulties and others encountered during the progress of the work it is interesting to review the obstacles successfully overcome, and to examine the design and construction that were adopted.

The bridge divides itself into two distinct portions, each 300 ft. in length, the eastern half consisting of a single span over the river, and the western or land half comprising three spans of 100 ft. each. Both sections are supported by the main or centre pier, which is built of six 8-ft. diameter cast iron cylinders in a double row, with four smaller auxiliary cylinders. The latter were not included in the original design, but were added subsequently to give additional bearing surface, and are secured to the others by strong brackets. Where the bridge joins the embankment it rests on a masonry abutment, and two intermediate piers, each composed of three cast iron cylinders 6 ft. in diameter and 1¼ in. in thickness, divide the land portion into its three 100 ft. spans.



Chepstow Bridge.
Transverse Section
at Middle of Span; | at Middle Pier.

Very careful consideration was given to the question of sinking the piers, and Brunel made extensive experiments on a cylinder with a screw thread at the bottom, which was driven into the ground by turning. Eventually, however, he decided to adhere to the method proved by him elsewhere to be successful. This consisted of providing the bottom of the cylinder with a cutting edge, so that it would penetrate the ground easily, and weighting it on top. The soil inside was then loosened and excavated, while the water was kept down by pumping. With this method a secure foundation was assured and additional cylinders could be provided in order to obtain any amount of bearing surface that might be required.

During the progress of this part of the work special precautions were necessary on account of the wet sand and shingle, which had a tendency to run in from the outside while excavation was being carried out. Frequently the sand burst in so rapidly that the workmen barely had time to escape with their lives. This not only endangered the men, but also threatened the stability of the cylinders, as it might easily have caused them to tilt over sideways. After some experience the trouble was largely surmounted by using stiff clay to prevent the wet sand and gravel from being squeezed in. Great care was taken also not to excavate too near the bottom, but merely to loosen the ground near the cutting edge and force the cylinder down by weights.

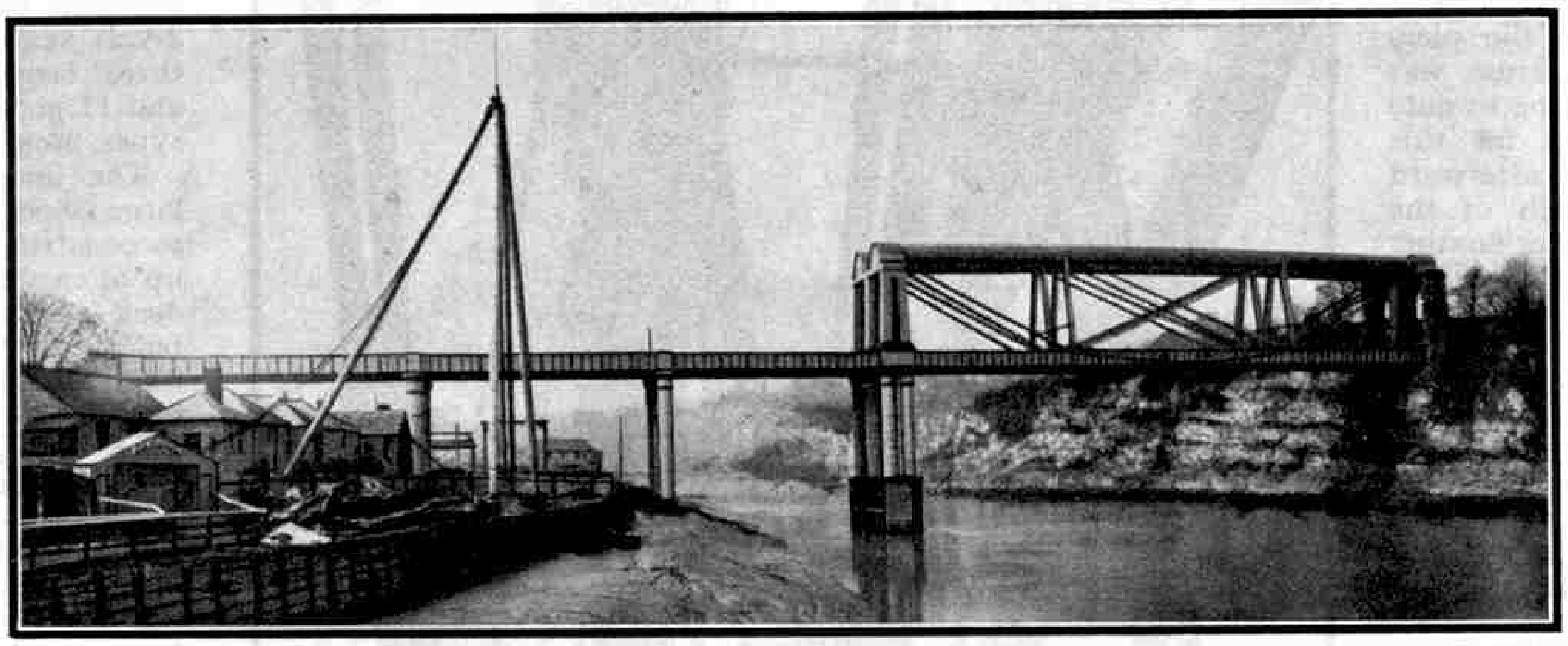
The main pier was by far the most difficult proposition owing to the presence of large boulders and pieces of timber near the bottom, which seemed to indicate a much older river bed. One of the cylinders cracked as a result of meeting an obstruction when still some distance from the rock. Timber struts had to be fixed inside until the obstacle was passed, after which the cylinder was strengthened with a strong wrought iron hoop and forced down to its bed.

Enormous quantities of fresh water were tapped during the sinking of the cylinders and a 30 h.p. engine was constantly required for pumping. At high water the work had to be suspended in many of the cylinders until the tide had receded. It is somewhat curious that, although the river is tidal, no salt water was encountered inside the cylinders.

As the work proceeded it became obvious that, owing to the delays caused by large influxes of water and the various other difficulties encountered, the piers could not be completed by the required time. In April 1851, therefore, Brunel decided to use the pneumatic system for the remaining cylinders, and they were sunk by this means. In the pneumatic process the cylinder is sealed at the top and air is pumped in until the pressure is sufficient to force the water out at the bottom. An intermediate chamber, or air-lock, fitted with air-tight doors, is provided for the workmen excavating the interior, as otherwise the pressure inside would be much too great. The sinking is completed, as before, by the addition of weights to the top of the cylinder.

When all the cylinders had been sunk to the rock, and this had been levelled off to give a firm foundation, they were filled with concrete. This was effected by placing a mixture of Portland cement, sand and gravel in a canvas bag and lowering it to the bottom of the cylinder. The concrete was then deposited under water by pulling a rope attached to the mouth of the bag. When there was sufficient concrete in the cylinders to obviate the danger of their floating when emptied, the water was all pumped out and the concrete filling completed in the ordinary way up to the level of the railway. It was anticipated at the time that the concrete thus provided would enable a cylinder to be taken out and replaced in perfect safety, should it show any signs of decay, but so far this has not been found necessary.

The superstructure, particularly of the main span, is the chief feature of the work, and is in many respects unique. The bridge really consists of two almost distinct structures, one for each line of way; and one half was brought into use a considerable time before it was all completed. The railway is carried on longitudinal girders 7 ft. 6 in. in depth, each of which has a top triangular cell flange to resist compression, and a slightly curved bottom plate to resist expansion. The girders over the land spans are in one length, and are therefore continuous girders 300 ft. in length, supported at each end and at two intermediate points.

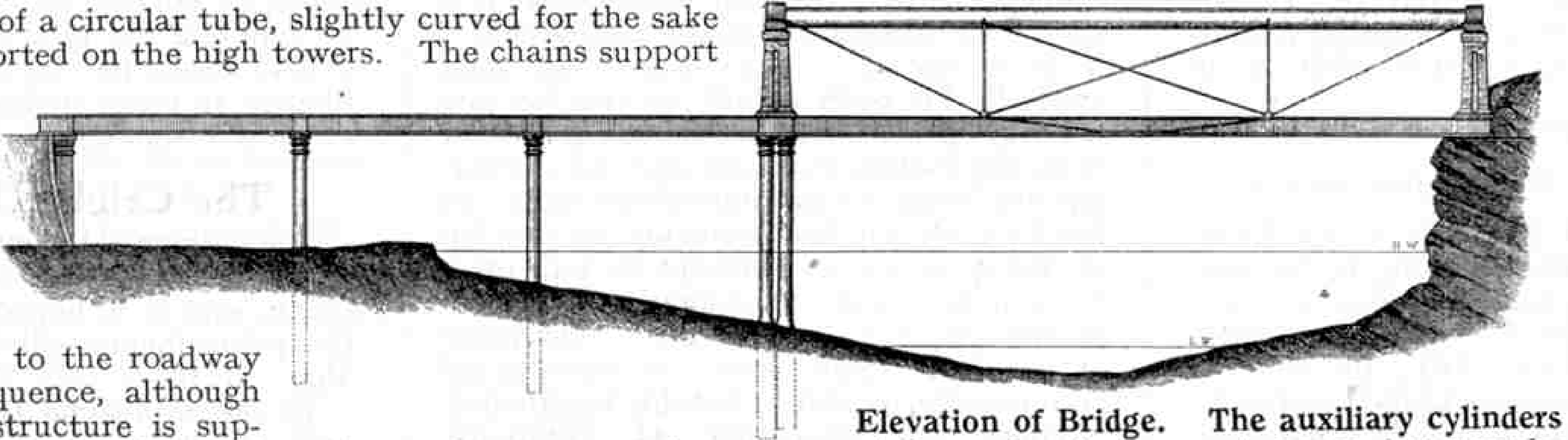


Courtesy] [Great Western Railway

General view of Brunel's bridge across the river at Chepstow as it appears to-day.

This part was comparatively simple, but the main span gave Brunel ample scope for his ingenuity. Here also the girders are in one length of 300 ft., and the problem was to give them intermediate support. Direct suspension was out of the question, because in an ordinary suspension bridge the chains hang in festoons and are free to move from side to side under the influence of any moving load coming upon them. Obviously this flexibility could not be permitted in a railway bridge, for the continuous rail would be destroyed immediately the smallest deflection took place, as inevitably would happen when a load came upon the structure.

Brunel therefore devised a truss from which he could support the girders and at the same time secure the necessary rigidity. From the cylinders of the main pier a tower was built up, surmounted by wrought iron cross girders; while on the land side of the main span a similar tower was erected entirely of masonry. The towers rise 50 ft. above rail level and have arched openings to admit the trains. The truss for each line consists of two suspension chains, one on each side of the track. These are hung from the ends of a circular tube, slightly curved for the sake of appearance, supported on the high towers. The chains support the longitudinal girders at two points, at each of which a stiff wrought iron girder rests on the chains and extends upward, firmly connecting the tube to the roadway girders. In consequence, although the weight of the structure is supported in a manner rather similar to that of the ordinary suspension bridge, the inward pull is resisted by the tube, since it serves to keep apart and steady the towers.



Elevation of Bridge. The auxiliary cylinders of the main pier are not shown, but may be seen in the transverse section on page 292.

To prevent any distortion of the framework, this is made more rigid by crossed diagonal chains connecting the upper and lower ends of the two upright standards, and these chains act alternately as the "rolling" load crosses the bridge. This arrangement ensures that, at whatever part of the span an engine may be passing, its weight is distributed all over the tube and chains.

Some parts of this main truss merit more particular description. The chains are like those of an ordinary suspension bridge, but have unusually large links, each being 20 ft. in length, 10 in. in width, and varying from ¾ in. to $\frac{11}{16}$ in. in thickness. Brunel went to very great pains to get these rolled in a single piece without welding on the eyes, such a thing not having previously been attempted. Eventually he had to go to the manufactory himself in order to get the men into the way of carrying out the work!

The tubes are each 9 ft. in diameter and are built up of ¾ in. and ⅝ in. plates; they can be seen very clearly in the illustration showing the bridge through the centre tower. At equal distances of about 30 ft., the tube is strengthened within by iron diaphragms, or discs, which add very little to the weight but at the same time give greatly increased strength. From the main pier access is provided to the interior of the tubes in order that they may be examined periodically.

At the points where the chains join the tube, this is strengthened by several thicknesses of plate between which the links are passed, being firmly secured by a 7-in. pin passing through both link and plates. The two tubes are braced together horizontally in order to give added lateral stiffness, although they are quite distinct. The tubes are fixed to the girder on top of the river pier, but are free to move on rails provided on the masonry tower, in order to allow for expansion and contraction.

Where the chains intersect the longitudinal girders, the latter are not fixed to, but rest upon, the chains; rollers and saddles being placed between, at each end of the short horizontal links. These can be seen in the photograph of the whole structure. Adjusting screws are provided for altering the level of the girders.

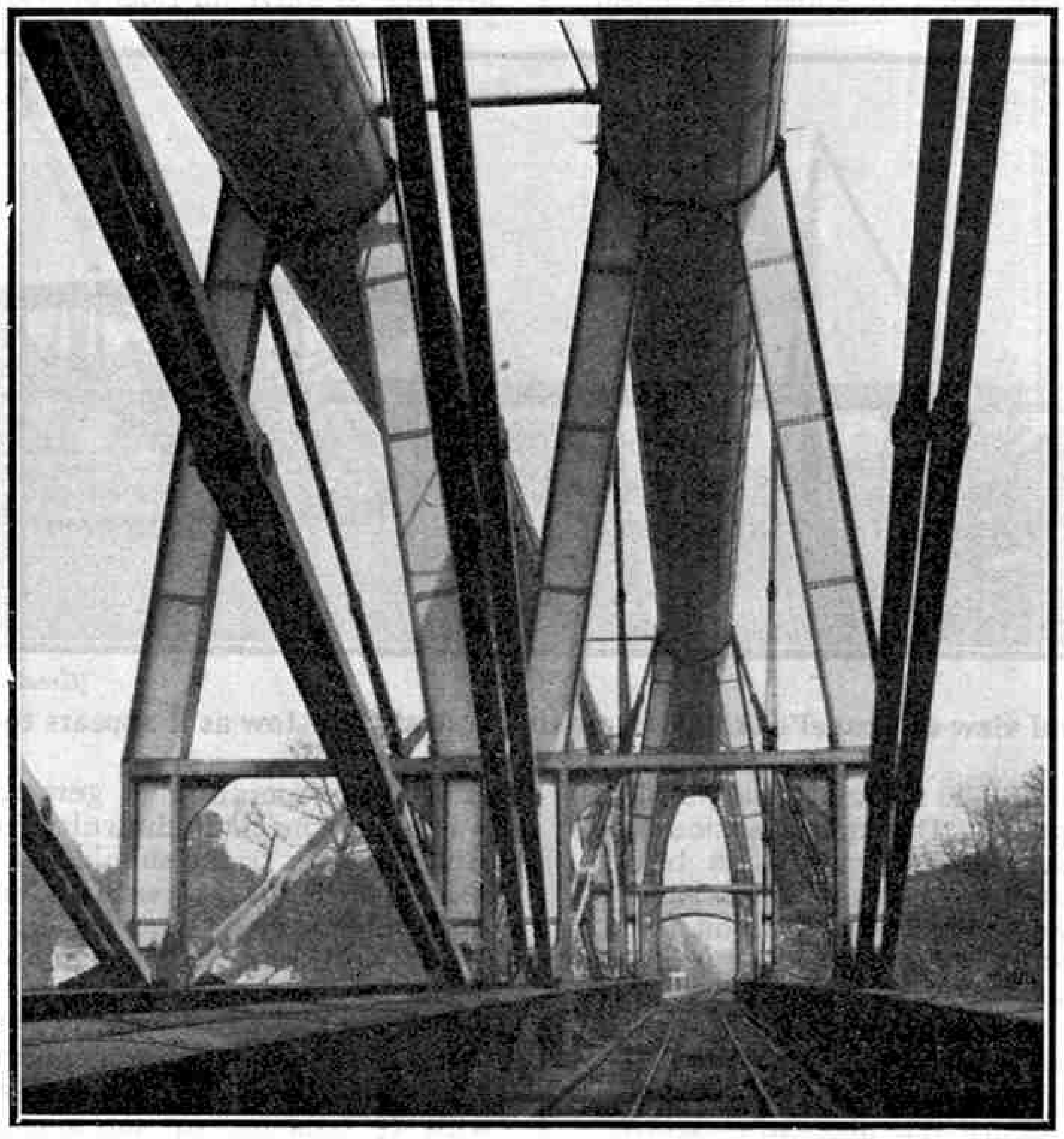
As may be imagined, the operation of getting these huge trusses into position was one of no little difficulty, more especially as it was necessary that the river traffic should not be interrupted for any long period. This consideration greatly influenced the design, which was such that its erection required no scaffolding, and navigation was never interfered with for more than one tide.

Directly the ironwork of the first truss was completed, it was assembled close to the site of the bridge and parallel to the river bank. The ends were supported on temporary piers and the whole structure was thoroughly tested by weighting it uniformly with 2¾ tons per sq. ft., a total load of 770 tons. In order to ascertain its strength when loaded unequally the weight was taken off from one end. The results of these tests were found to be highly satisfactory, and the truss was therefore taken to pieces and arrangements were made for its erection.

Piles were driven into the river bed from the western shore out as far as the main pier. Upon these a temporary railway was laid, and strong temporary erections of timber were constructed on each side of the river. The truss had been made so that it could be divided into easily handled parts, and the tube was temporarily stiffened with portions of the main chains so that it was capable of carrying its own weight when supported at the ends.

After a considerable amount of careful manœuvring, the tube was slewed on to a platform at right angles to the river and placed on a carriage on the temporary railway. A pontoon was next prepared by placing three canal barges crossways and bottom upward upon three similar barges floating in the river. Before high tide on Thursday morning, 8th April, 1852, the tube was moved forward on its carriage until one end overhung the pontoon. As the tide rose, the pontoon floated with the end of the tube resting on it. Everything then was ready for the delicate task of drawing the tube into position.

Hawsers were attached to the barges up and down the stream so that, by hauling on one or the other, the pontoon could be guided in a straight line across the river. As the hawsers were pulled the carriage was moved forward, and the tube was soon safely in position ready for erection. The operation commenced a little after nine o'clock, and by a quarter to ten the pontoon had reached the other side. It is recorded that "all proceeded with perfect quiet and regularity under the management of Mr. Brunel."



Courtesy] [*Great Western Railway*

Looking through the main span of the Chepstow Bridge.

As soon as the tube was in position the chains of the lifting tackle were attached, and it was raised to the rail level during the course of the day. Subsequently it was lifted to the top of the piers and the rest of the truss was added. It is interesting to note that the crabs used for this lifting tackle were afterward utilised at the launch of the "*Great Eastern,*" and for floating the trusses of the Royal Albert Bridge at Saltash.

On Wednesday, 14th July, 1852, as soon as the one line of way was ready, a private trial of the bridge took place, and it was publicly opened the following Monday. Some months later the second truss was erected and the whole structure completed.

The greatest height from high-water mark to the top of the tubes is over 100 ft. There are 1,280 tons of wrought iron and 1,060 tons of cast iron in the structure, the cost of which was about £77,000.

Chepstow Bridge is on the Great Western Railway Line from Gloucester to Newport. Formerly this stretch was part of the main line from London to South Wales, the immense detour via Gloucester being necessary in order to overcome the obstacle presented by the Bristol Channel. The opening of the Severn Tunnel gave a shorter and more direct route into South Wales, and the former main line now joins the new one at Severn Tunnel Junction, 7¼ miles from Chepstow, having first passed over the latter while it is in the tunnel.

Electric Railways—(*Continued from page 291*)

After more than 30 years of service it was considered that something better was required, however, and in 1920 a contract was placed with the Westinghouse Brake and Saxby Signal Co. Ltd., for the re-signalling of the line on up-to-date methods. The new installation was duly completed and was passed by the Board of Trade in August 1921. All the signal indications are given by coloured lights, both day and night, and there are no semaphore arms. The signals are controlled by what are called track circuits, a feature of all automatic signalling. Signal-boxes are still required at Dingle, where trains at the terminus arrive on one line and have to be crossed to the other; and also at Seaforth Sands, where also trains are reversed and where the car storage and repair sheds are situated.

At the crossovers ground frames are provided, which normally are out of use. Before the crossover points can be moved the neighbouring signals must be put to danger by means of the ground frame levers, and this cannot be done unless the corresponding sections of track are clear of trains. The layout of the new signalling was based on a train speed of 20 m.p.h., an acceleration of 1.1 ft. per second, and a braking rate of 2 ft. per second. The trains are 130 ft. in length. The usual arrangement is to have a stop signal about 300 ft. in the rear of a station and another immediately ahead of the outgoing end. There are no "distant" or warning signals, as speeds are low and a good view is obtainable.

The rolling stock is fitted with trip valves mounted on the motor truck frames, and special relay valves are so arranged in connection with the trip valves that if a train over-runs a signal that is at "danger" it is "tripped." The brakes are then applied, the main circuit breaker on the train is opened and the current is cut off from the motor, thus automatically bringing the train to an immediate stop. It has been shown that normally an overlap of 300 ft. is amply sufficient to pull up a train in the event of automatic application of the brake in this manner. On parts of the line where there are exceptional gradients the overlap is suitably lengthened.

There are altogether 44 automatic signals, eight semi-automatic signals, and 12 mechanically-operated running signals, as distinct from shunting signals.

At four different places along the line opening bridges are provided. At the Stanley Dock there is a hydraulic swing bridge which, when opened, allows vessels to pass into the dock. This bridge is a double-deck structure carrying the Overhead Railway on the upper platform and the dock lines of railway on the lower one. The lower level bridge is fitted with bascule leaves so that barges and smaller craft can pass without the necessity of swinging the bridge. At three other points hydraulically-operated bascule bridges are provided to allow the passage of loads that are too high to go underneath the main girders.

No Hornby Train or Meccano enthusiast who happens to be in the Liverpool district should omit to take a trip on the Overhead. Beside the interest of the line itself, the journey gives a fine view of the docks, and a useful ticket-booking arrangement is in force whereby passengers may see over some of the giant liners that use the docks.

Building a Model Town—(*Cont. from page 295*)

The railway, which is about 60 ft. in length, adds greatly to the attractiveness of the model. It is electric with centre rail, and the locomotives are driven from an 8-volt accumulator. There are three large passenger coaches and 11 goods wagons of various types, most of which are Hornby.

The liner, which is quite a large vessel, was very interesting to construct. The hull is built up of cardboard with a wooden deck and bottom and wooden bulkheads to support the deck. Some of the many fittings were home-made, but most of them were bought. The hull is painted black and the superstructure white. In addition to this ship there is also a destroyer, which is not shown in the photograph. This was built in a similar manner. It has four funnels and is of an oldish type with turtle decking in the front. It has numerous interesting little fittings such as torpedo tubes and guns, and it is painted naval grey.

The sea consists of green cloth tacked down and streaked with blue and white paint to give the appearance of waves. The small beach is made of roofing felt painted yellow, and small stones are scattered about here and there. There are also several small boats lying about, but these are not shown.

The cost of the whole town and its equipment was about £30. This cost could, of course, be reduced very greatly by building the model on a smaller scale, and in particular by making more of the fittings at home instead of employing the attractive but costly shop-made articles.

The Cricket Bat Contest

The judging of the entries for this contest, which closed on 31st March, is now in full swing, and it is hoped that the names of the prizewinners will be published in the May "*M.M.*"

In the meantime the bat continues its tour and during April it will be displayed by the following Irish Meccano agents.

1st to 5th April – R. G. Donaldson, Camera House, Metropole Buildings, Cork.
8th to 12th April – Mrs. James L. Dixon, 14, Suffolk Street, Dublin.
15th to 19th April – Riddels Ltd., Donegal Place, Belfast.
22nd to 26th April – Nester Bros., 28, 33 and 132, O'Connell Street, Limerick.

"Photography Simplified"

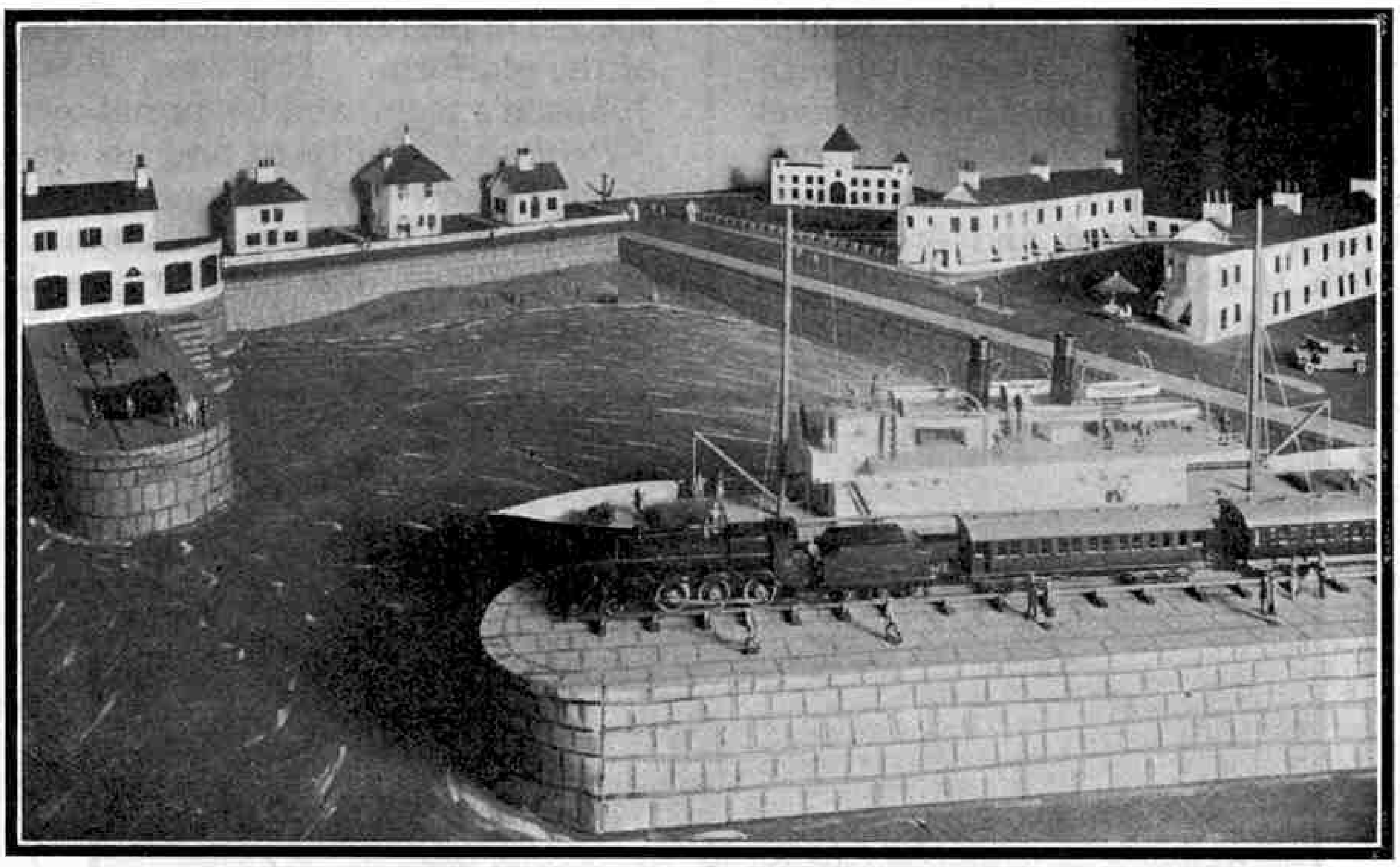
An admirable little booklet with the above title deals simply but correctly with the problems of exposure. The relationship between light and the subject, the two main factors that govern length of exposure, is dealt with in a manner that may be understood by the beginner, but is yet quite interesting to the expert.

The booklet is well printed and illustrated and will be found useful by all who wish to obtain from their hobby increased pleasure at least cost. It will be sent free of charge to any reader who makes application to the publishers, Burroughs Wellcome & Co., Snow Hill Bldgs., London, E.C.1, and mentions the "*M.M.*"

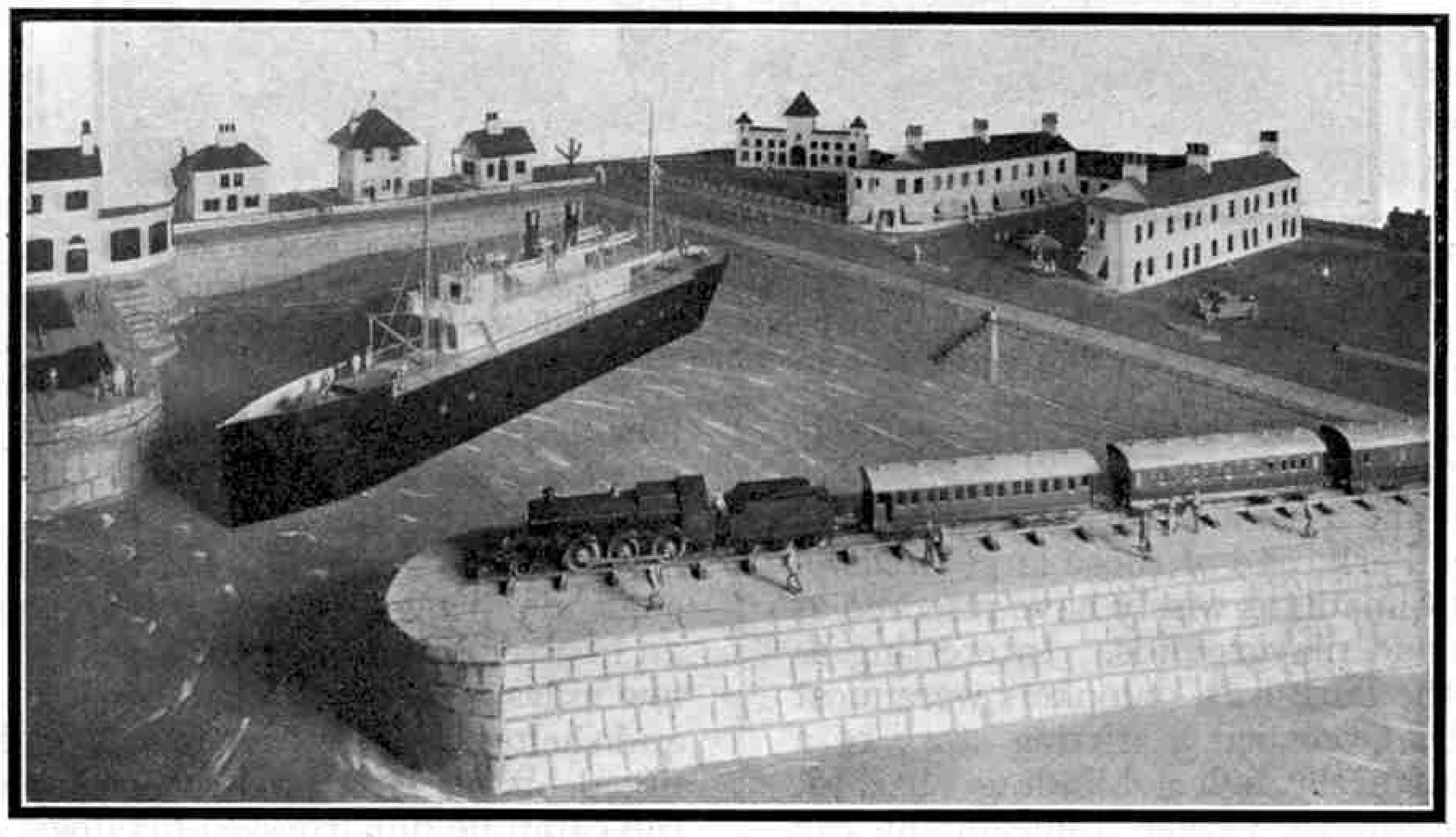
The Building of a Model Town

By R.B.H.

MODEL-BUILDING of any kind has a fascination that grows on one to an extent that is only realised by those who have experienced it. As a rule, in the first stages of the hobby one builds all kinds of small models, without any particular scheme in view, and simply as the ideas occur. It is not long, however, before the ambition arises to build a really big model full of details on an elaborate scale. The illustration on this page shows a model town and harbour that grew up as the result of an ambition of this kind. In many respects the model is far from perfect, but it shows the possibilities of this class of work and may serve as a suggestion for more extensive schemes. At any rate it can safely be said that the building of the model gave the keenest pleasure, and the interest is maintained by the little improvements and additions that are made from time to time with a view to adding to the realistic nature of the scheme.



General view of the model town built by the author, showing the realistic appearance of the harbour and the buildings.



Another view of the model with the liner placed so as to show the details of its construction.

The original idea of building a model town was thought of some considerable time before operations were actually commenced. First of all plans were drawn up and prices worked out so that the approximate cost should be known beforehand. The next point was to decide where the model should be built, and fortunately there happened to be at the time a spare room in the house that seemed to be the very thing for the purpose. The room measures 15 ft. by 17 ft., and difficulties in regard to scale soon cropped up; finally it was decided to adopt a scale of a quarter inch to the foot.

The first part of the model to be undertaken was the land. This is about six inches above the floor and is constructed of wood. For convenience it was decided to make the curving ends of the two piers of cardboard, and the piers and the sea wall were painted to look as though they were built of stone. The roads were next tackled. At first there was some difficulty in securing anything like a realistic appearance, but after many experiments roofing felt was used, and this gave an excellent representation of tar macadam. The houses have a wooden base and top and are completed with white cardboard tacked in position. The roofs form a separate part in each case and are painted red to represent tiles. The grass, of which there is quite a lot, is green baize, and looks quite realistic.

The town possesses an attractive shopping centre, the shops being built of similar materials to the houses and equipped with neat sun blinds. Since the photograph was taken the cottages immediately beyond the double row of shops have been replaced by a handsome cathedral. A railway station also has been added. The barracks occupy an excellent site commanding a full view of the harbour, and is fronted by a neat, well-kept parade ground. Two sentry boxes, one at each side of the road, mark the entrance to the barrack grounds.

The next thing that had to be considered when the town had begun to grow was the provision of the necessary inhabitants. These were purchased; in all there are about 40 ordinary civilians, 100 marines, 50 sailors and about 20 generals, admirals, policemen and other officials.

(*Continued on page 294*)

Epic of the Frozen North

Thrilling Race with Death Through a Blizzard

IN spite of the advance of railways and the introduction of the motor car, there are yet on the northern fringe of the prairie provinces of Canada extensive open spaces and many lonely posts inhabited only by Indian trappers and fur traders. During the long winter experienced in these regions the ground is covered with snow and the rivers are frozen. The inhabitants travel on snow-shoes and practically the only means of transportation is by sledges drawn by teams of powerful dogs or "huskies." The country is settled and orderly in character, and fights with Indians or with outlaws are practically unknown, but even to-day struggles with storms and blizzards provide opportunities for deeds as heroic as any performed in what are often called "the good old days," and from time to time we are thrilled by stories of exploits of this kind.

A proof that the so-called good old days have not entirely gone was given when an interesting ceremony took place on the shore of Lake Waskesiu, a beautiful sheet of water near Prince Albert, the most northerly city in the province of Saskatchewan, Canada. There a large platform had been erected and hung with bunting. On it were Mr. W. L. McKenzie King, Prime Minister of Canada, and many other notable Canadians, while around it were grouped what was for the sparsely inhabited district a very large audience.

The chief purpose of the assembly was the opening of Prince Albert National Park, one of those large areas of unspoiled country that Canadians wisely have reserved as national beauty spots and playgrounds. Interesting as the official opening of the Park was, onlookers were most thrilled by an event that recalled a stirring story of a desperate race with death through a blinding blizzard. This was the presentation to Verner Johnson, of Big River, of a certificate of the Royal Humane Society for saving the life of a girl by rushing her on his sledge through the storm over a distance of more than 120 miles in order that she might receive the medical attention that she so urgently needed.

Johnson himself was the hero of the day and naturally aroused great interest both among the spectators and among the people assembled on the platform. With the modesty usual in those who perform heroic deeds without thought of reward, Johnson refused to agree that he had done anything of an extraordinary character. In fact, he insisted that the greater part of the credit for the success of his race with death was due to another occupant of the platform. This was "*Prince*," the "lead" dog of Johnson's team, and his proud owner asserted that it was "*Prince's*" ability to find his way across country when driving snow had obliterated ordinary landmarks that enabled him to bring his charge safely to the station at Big River, the northern railhead in Saskatchewan of the Canadian National Railways.

Courtesy] [Canadian National Railways

Verner Johnson of Big River, Saskatchewan, and "*Prince*," the leader of his dog sled team. Johnson is holding the Certificate awarded him for the heroic feat described in this article.

To Johnson it was a very great ordeal to stand on the platform before the assembled crowd. His nervousness betrayed itself partly by the manner in which one hand continually grasped and released the rail in front of him, but chiefly by the tight hold he kept on "*Prince*," for this magnificent "husky" is his greatest friend, and it was to his dog that he turned for support on the platform, just as he had done when lost in the blizzard!

The event had happened a few months earlier, in the depth of the Canadian winter. The evening of 14th January, 1928, found Johnson pushing his team along on the snow-covered ground in a lonely spot 120 miles north of Big River. The weather was threatening and the snow that was beginning to fall was obviously the precursor of a blizzard.

How long a blizzard in the far north of Canada will continue to rage can never be foretold. It may cease in an hour or it may last for a week! Johnson knew that a few miles ahead was a cabin where he would find friends and shelter, and in order to escape the oncoming storm he urged his dogs forward at greater speed. On arrival at the cabin he unharnessed his dogs, threw each of them a fish, and entered the tiny wooden habitation. There was no need to knock, for in the wilds of Canada every wayfarer is welcome, and there are no locks or bolts!

To Johnson's surprise the owner of the cabin was absent, and the only inhabitants were the owner's wife and a girl, who was obviously very ill. To the former Johnson's arrival seemed providential. Rapidly she explained the situation to him, and he realised that it was

A dog sled team in northern Canada. In some of the annual dog sled "Derbys" that are a prominent feature of life in a Canadian winter the leading teams cover distances of 120 miles in little more than 11 hours.

indeed desperate. The girl was suffering from acute appendicitis, and to leave her lying in the cabin meant certain death. The only hope of saving her was to rush her to Prince Albert, where there was a hospital and skilled doctors. But Prince Albert could only be reached after a sledge journey of 120 miles. Until Johnson came, even this was impossible, for while there was a sledge outside the door of the cabin, there were no dogs, the owner having taken them with him on his departure a few days previously!

The blizzard had now become intense. Johnson himself was tired, and his dogs had done a hard day's work, but without the slightest hesitation he said briefly "I'll take her down." Quickly the girl, now unconscious, was strapped on the sledge, the dogs were harnessed and the long journey to Big River begun.

Johnson had only made eight miles when disaster overtook him, for one of his sledge runners gave way. He patched it up as best he could, but realised that with the crippled sledge it would be quite impossible for him to reach Big River. Suddenly he remembered the sledge outside the door of the cabin. He turned his dogs round and returned to the cabin in order to transfer the unconscious girl to the new sledge. Then again he rushed off into the blizzard with the knowledge that in his race with death he had travelled 16 miles to no purpose.

Courtesy] [Canadian National Railways

A rest by the way. Dog sled teams halted at lunch time during a journey along the Blanc Bec Trails to visit trap lines and big game haunts.

He himself knew what he was doing and had determined to leave no stone unturned to bring the girl in safely—and in time—to Big River, but his tired dogs could not be expected to understand why they had been dragged from the shelter of the cabin, and driven forth into the blinding blizzard for a second time. It speaks volumes for their faithfulness that they went willingly, and in the darkness they struggled gallantly to overcome the difficulties that beset them.

A still more serious consequence of the delay due to the broken runner was that in the meantime the blizzard had become fiercer. The heavy snowfall hid the trail and Johnson met with every increasing difficulty in his efforts to find his way. Half-blinded by the flying snow he struggled on throughout the night, his clothes frozen into a sheet of stiff ice. Towards morning he lost the trail completely. He continued to plunge forward in the hope that he was heading for Big River, but suddenly caught sight of his own tracks. He had circled back on his course, and was lost in the wilderness of snow!

It was in this emergency that "*Prince*" came to the rescue. Until this moment he had struggled on at the head of the line of huskies, doing his full share of the pulling, but now he was called upon to use his canine intelligence. He had previously travelled over the trail and to him Johnson abandoned the task of finding the route to Big River. It was only one chance in a million—but not to take it meant utter failure.

"Mush, mush on, *Prince*," he called out, and as the sledge moved forward he himself stumbled blindly along at the runners. Whither he was going Johnson did not know. He was nearly spent and could only keep up by hanging on to the sledge and occasionally jumping on.

The approach of daylight revealed a cabin in a clearing about a mile ahead. The sight put new life into the tired man, for this he recognised at once as an outpost of Big River, his destination. He forced his almost exhausted team into a gallop and a few minutes later swung up into the railroad station at Big River.

Johnson did not know if his race had been won. His share was finished, however. Rapidly he told the railway officials what had brought him to Big River, and they acted promptly. Standing in the station was a Canadian National train waiting for orders to move south, the blizzard having delayed it. Quickly the locomotive was uncoupled and attached to a caboose in which the girl was placed, and in a few moments the train was thundering on the way to Prince Albert.

(*Continued on page 314*)

New Meccano Models

Skier—Steam Engines—Autogiro—Catapult—Paddle Steamer

Since its inception in January, 1928, the series of articles entitled "New Meccano Models" has proved one of the most popular model-building features ever published in the "M.M." The number of entirely new and original subjects that have been included now totals no less than 149. We hope to describe many further new models in the future, and shall endeavour to vary the selection so as to cater for the requirements of the great majority of Meccano model-building enthusiasts.

THIS month we are able to describe a varied selection of new models, which will, we hope, provide much amusement for those who undertake their construction. The simpler models comprise another version of the famous Meccanitian (this time engaged in "winter sports"); a neat model of Watt's beam engine; an autogiro aeroplane; and a catapult, a practical weapon which will shoot small missiles with considerable force. In addition, a model of a two-cylinder stationary steam engine and a realistic paddle steamer will provide the more advanced constructor with useful new material for model-building.

The Meccano Skier

Fig. 1 shows the Meccano Ski-ing Champion, photographed while practicing at St. Moritz, or so we are informed by the Meccano boy who designed him! His body consists of a 2½″ Strip, to which are attached the arms and legs (further 2½″ Strips) by means of Double Brackets. His head consists of a ½″ loose Pulley secured to the body by means of a Flat Bracket, while Angle Brackets do duty for feet. Each ski consists of a 12½″ Strip slightly curved at one end, and attached to the foot by bolts and nuts, two washers being placed between the foot and Strip so that the shank of the bolt is flush with the retaining nut and thus does not deter the Meccanitian from propelling himself over the snow!

In order to build this model the following parts will be required:—2 of No. 1; 5 of No. 5; 1 of No. 10; 2 of No. 11; 4 of No. 12; 2 of No. 16; 2 of No. 22; 1 of No. 23; 4 of No. 35; 12 of No. 37; 1 of No. 37a; 4 of No. 38; 1 of No. 111c.

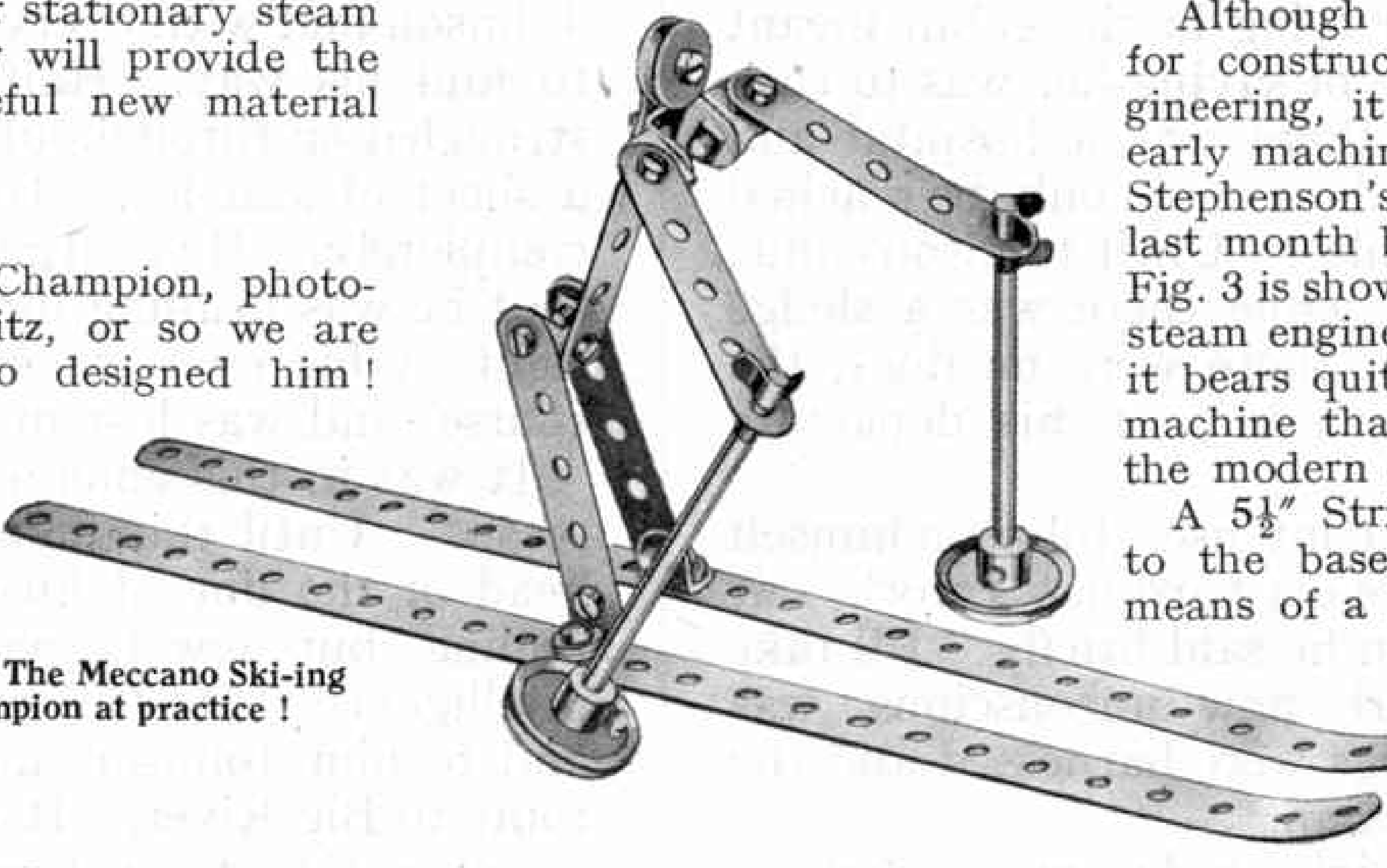


Fig. 1. The Meccano Ski-ing Champion at practice!

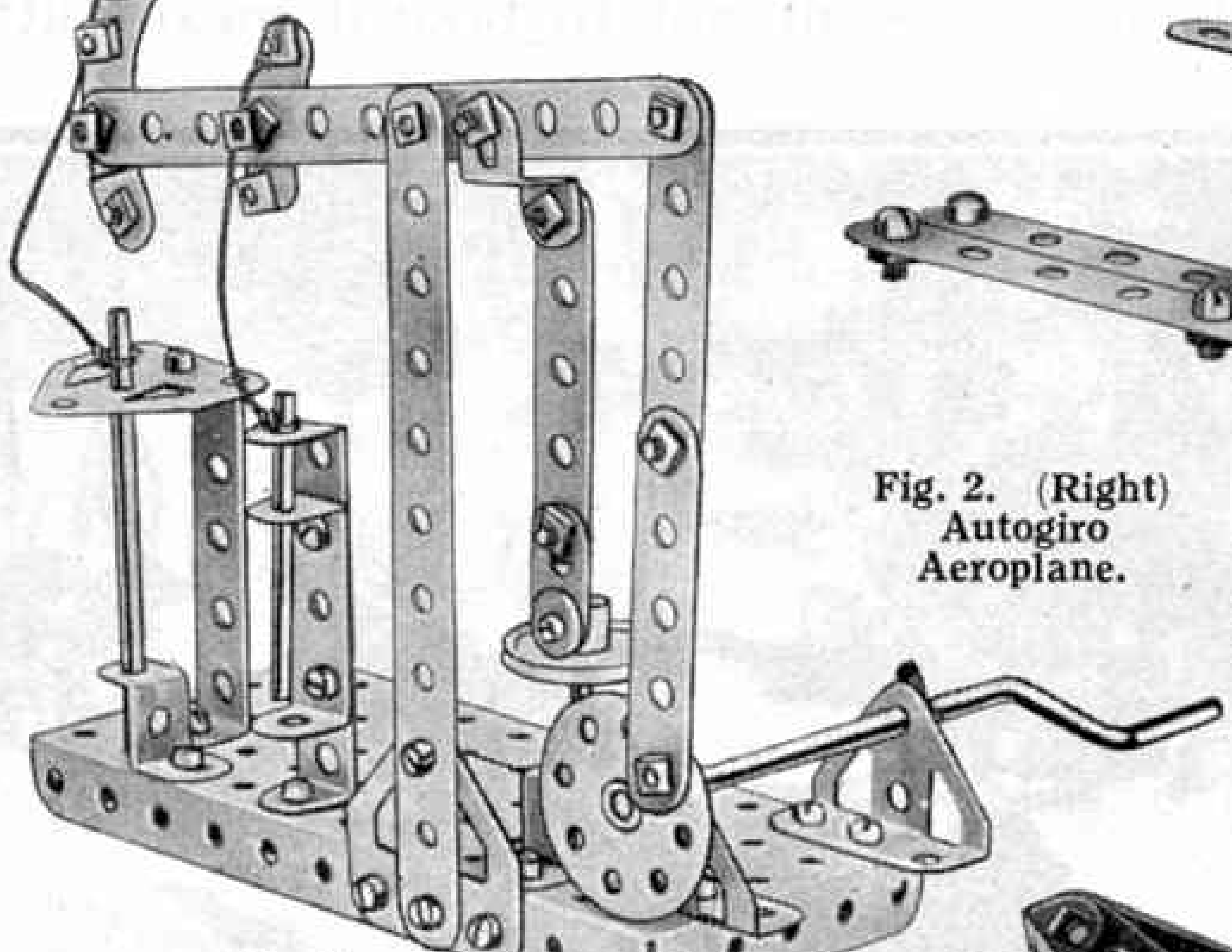


Fig. 3. Watt's Beam Engine.

Autogiro Aeroplane

The prototype of the model shown in Fig. 2 is the famous Autogiro or "windmill plane," a new type of flying machine built on the helicopter principle. The actual machine possesses the advantage of being able to rise from, or alight on, the ground with a "take-off" of only a few feet, and the 'plane can consequently be manœuvred in very confined spaces.

The fuselage consists of four 5½″ Strips secured to a Bush Wheel by means of a 1½″ × ½″ Double Angle Strip and Angle Brackets. The other ends of the Strips are held together by Angle Brackets and Double Brackets, and a Cranked Bent Strip forming the tail fin is held in place by similar means. A Double Bracket represents the "undercarriage" and carries a short Rod on which two 1″ Pulleys are secured.

The wings are built up from Strips as shown, and the revolving "sails" consist of two 5½″ Strips clamped between 1″ Pulleys on a 2″ Rod journalled in a Double Bent Strip, and in the upper Strip of the "fuselage." To complete the model the propeller should be fitted on a 1½″ Rod held in the Bush Wheel forming the front portion of the fuselage, or "nose" of the machine.

The Autogiro comprises the following parts: 8 of No. 2; 3 of No. 5; 5 of No. 10; 2 of No. 11; 8 of No. 12; 2 of No. 17; 4 of No. 22; 1 of No. 24; 5 of No. 35; 31 of No. 37; 5 of No. 38; 1 of No. 44; 1 of No. 48; 2 of No. 125.

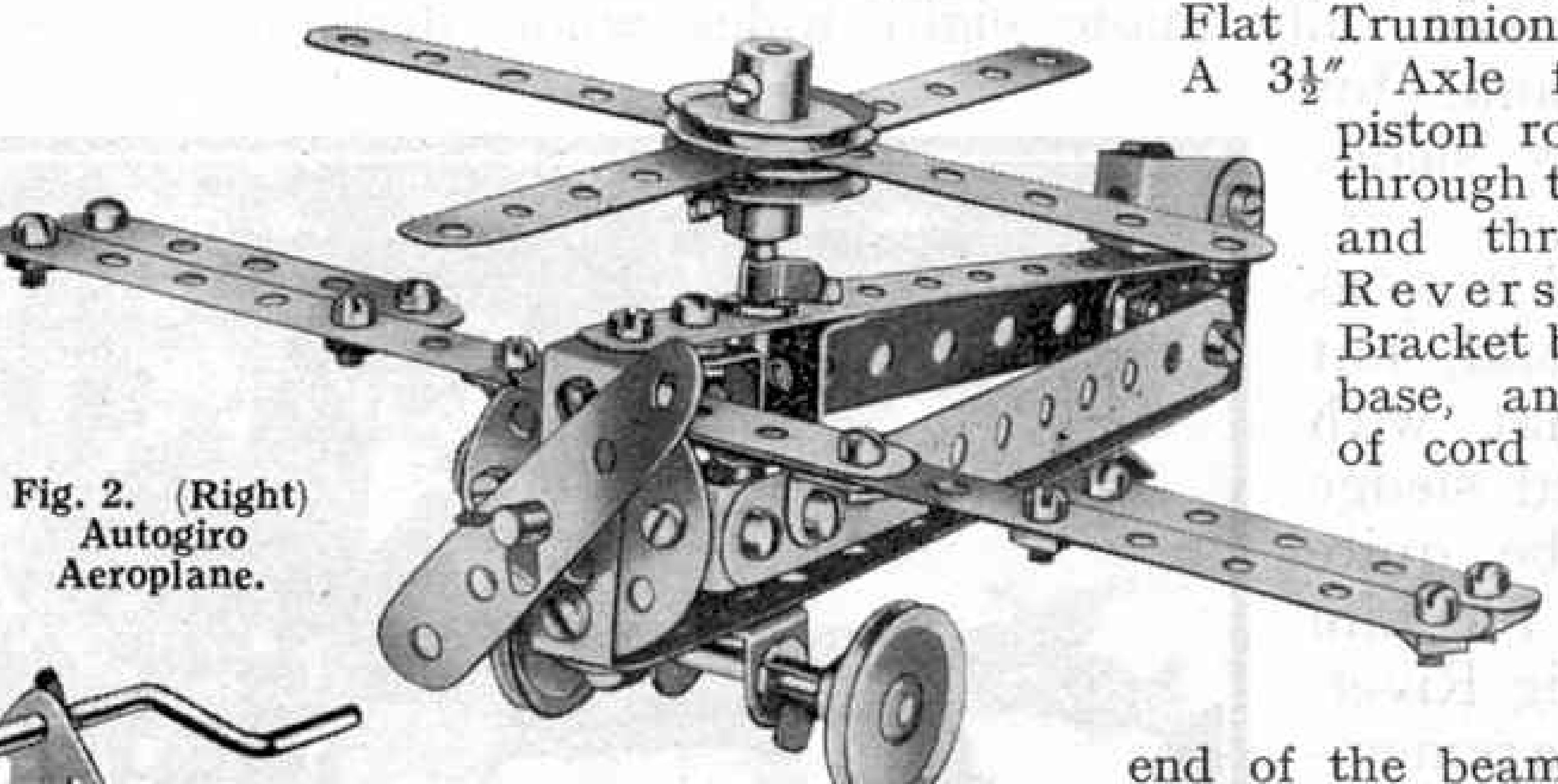


Fig. 2. (Right) Autogiro Aeroplane.

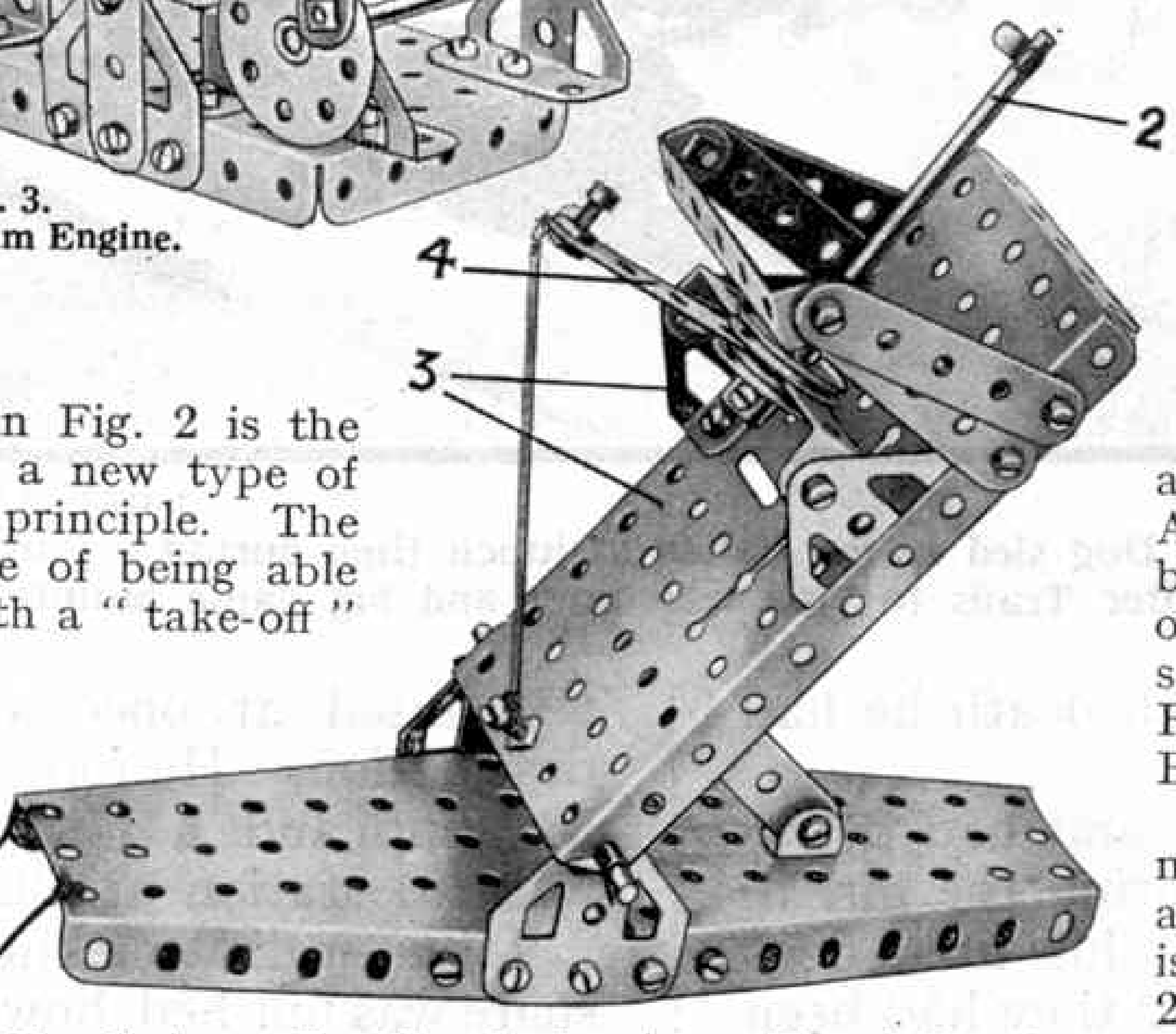


Fig. 4. (Left) A working model Catapult.

Model of Watt's Beam Engine

Although Meccano is generally employed for constructing up-to-date examples of engineering, it is just as useful for reproducing early machines and mechanisms, the model of Stephenson's "*Rocket*" that was described last month being a good example of this. In Fig. 3 is shown a model of James Watt's famous steam engine and although remarkably simple, it bears quite a creditable resemblance to the machine that has been called the "father of the modern steam engine."

A 5½″ Strip is fixed rigidly at right angles to the base (a 5½″ × 2½″ Flanged Plate) by means of a Flat Trunnion, and a further 5½″ Strip forming the beam is attached pivotally to its upper end. The cylinder consists of a 2½″ × ½″ Double Angle Strip to which a Flat Trunnion is bolted. A 3½″ Axle forming the piston rod is passed through the Trunnion and through a ½″ Reversed Angle Bracket bolted to the base, and a length of cord is attached to its upper end and tied to a 2½″ Curved Strip on the end of the beam.

The "valve chest" comprises a 2½″ × ½″ and a 1½″ × ½″ Double Angle Strip in which slides a 2″ Rod that is connected to the two Flat Brackets on the beam by a length of cord.

The "pump" is operated by a 2½″ Strip extended by a Flat Bracket and pivoted to a ½″ Reversed Angle Bracket that is secured rigidly to the beam. The Flat Bracket is held to the boss of a 1″ Pulley by a bolt screwed into the latter's set-screw hole. This bolt also grips a short Rod which works up and down in a Double Bent Strip attached to the base.

For demonstrating the movements of the model a Crank Handle is mounted in Trunnions and provided with a Bush Wheel. The latter is connected to the end of the beam by two 2½″ Strips bolted rigidly together.

The following parts are required for the construction of the model:—2 of No. 2; 3 of No. 5; 3 of No. 10; 2 of No. 12; 1 of No. 16; 2 of No. 17; 1 of No. 19; 1 of No. 22; 1 of No. 24; 1 of No. 35; 31 of No. 37; 8 of No. 37a; 2 of No. 38; 1 of No. 48; 2 of No. 48a; 1 of No. 52; 1 of No. 90a; 2 of No. 125; 2 of No. 126; 2 of No. 126a.

A Simple Model Catapult

The ingenious little weapon shown in Fig. 4 incorporates an elevation control so that its firing range may be altered at will. The base of the model consists of two Sector Plates held together by 2½″ Strips. Flat Trunnions are secured to the Plates and form journals for a 3½″ Axle Rod on which is mounted a 5½″ × 2½″ Flanged Plate. An Angle Bracket is secured to one of the Sector Plates and a 2½″ Strip is attached pivotally to this Bracket by means of a Bolt and two lock-nuts. The upper end of the Strip rests against the Flanged Plate and by adjusting the Strip, the angle between the base and the Plate can be varied.

Two Trunnions are bolted to the Flanged Plate and a 2½″ × ½″ Double Angle Strip is mounted pivotally between them on lock-nutted bolts. A 3½″ Rod is passed through the centre hole in the Angle Strip and clamped in position by two 1″ Pulleys. This Rod also carries a 2½″ Strip 4 which is connected to the Flanged Plate by means of a length of Spring Cord. To operate the model a small pellet should be placed on the Spring Clip attached to the Rod 2 and the latter then depressed and released.

In order to build the catapult the following parts will be required:—8 of No. 5; 1 of No. 12; 2 of No. 16; 2 of No. 22; 3 of No. 35; 24 of No. 37; 7 of No. 37a; 2 of No. 48a; 1 of No. 52; 2 of No. 54; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; A length of Spring Cord or Elastic.

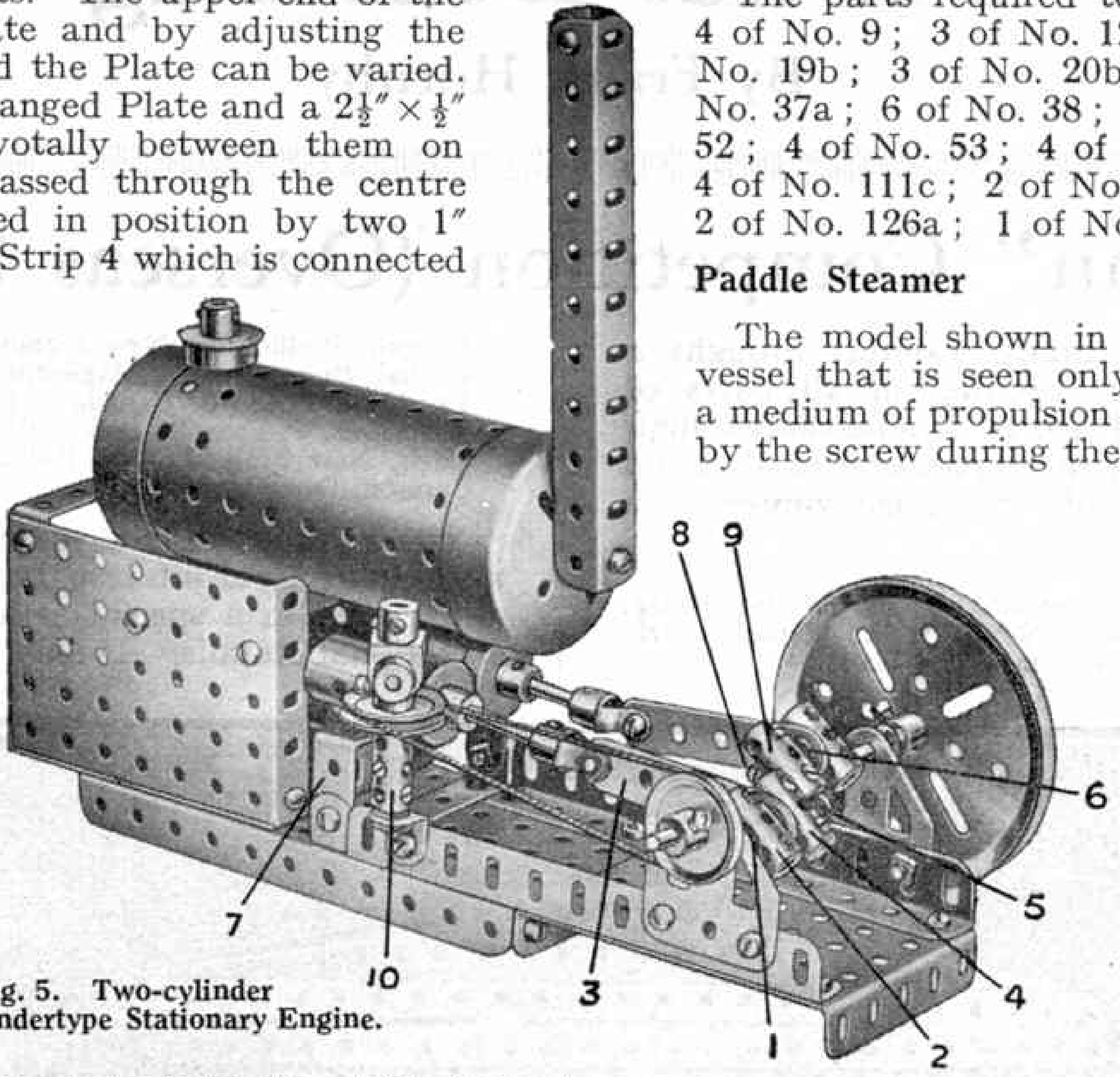


Fig. 5. Two-cylinder Undertype Stationary Engine.

Undertype Steam Engine

A realistic model of a two-cylinder stationary steam engine is shown in Fig. 5. The base consists of 5½″ × 2½″ and 3½″ × 2½″ Flanged Plates to which 5½″ Angle Girders are bolted. Flat Trunnions are secured to these to form journals for the crankshaft, which is built up from four Couplings joined together by ¾″ Bolts, in the following manner:

A ¾″ Bolt 1 is passed through the centre tapped hole of the Coupling 2 and screwed up tightly. The connecting link (a 2½″ Strip) 3 is slipped on the Bolt, being spaced by a Washer on each side, and the Coupling 4 is screwed on to the end of the Bolt 1 so that the connecting Rod revolves freely in the intervening space. The ⅜″ Bolt 5 is then screwed into the Coupling 4 until it grips the end of the Bolt 1. The second crank is assembled in a similar way but two Washers are placed at 6 and it is secured to the first by a ¾″ Bolt that is passed through the inner transverse hole of the Coupling 9 and through the corresponding hole of Coupling 4, and is gripped securely by the grub screws of both Couplings. The whole crankshaft is held rigid by the ⅜″ Bolts, for the head of Bolt 5 engages with the hole in the end of Coupling 9, whilst the head of Bolt 8 engages the end of Coupling 4.

Two 2″ Rods are used for the ends of the crankshaft, one carrying a 3″ Pulley to represent a flywheel and the other a Pulley round which a length of cord is passed, taking the driv to the centrifugal governor. The latter is built up from a large Fork Piece with Collars attached, and is secured to a 1½″ Rod journalled loosely in the Coupling 10, which is secured to the base as shown.

Each cylinder consists of a Sleeve Piece with a ¾″ Flanged Wheel pushed on one end. Both cylinders are secured to the 2½″ × 1″ Double Angle Strip 7 by means of bolts passed through the Sleeve Pieces.

The parts required to build the model are:—2 of No. 5; 4 of No. 9; 3 of No. 12; 2 of No. 17; 3 of No. 18a; 1 of No. 19b; 3 of No. 20b; 2 of No. 22; 40 of No. 37; 4 of No. 37a; 6 of No. 38; 1 of No. 46; 4 of No. 48a; 1 of No. 52; 4 of No. 53; 4 of No. 59; 5 of No. 63; 2 of No. 111; 4 of No. 111c; 2 of No. 115; 1 of No. 116; 1 of No. 116a; 2 of No. 126a; 1 of No. 162; 2 of No. 163; 1 of No. 166.

Paddle Steamer

The model shown in Fig. 6 is representative of a type of vessel that is seen only rarely nowadays, paddle wheels as a medium of propulsion having been almost completely ousted by the screw during the second half of the last century. The model is particularly true to type for it incorporates a two cylinder oscillating engine, this kind of engine being quite common in the days when "paddle wheels ruled the sea."

Each side of the hull consists of a 12½″ Braced Girder bolted to a 5½″ Flanged Plate, to one end flange of which a 3½″ × 2½″ Flanged Plate is secured. A 5½″ Braced Girder and a 5½″ Strip are also secured to this Plate. The sides are held together by a Sector Plate at the stern, and are bolted to a 2½″ Strip and Flat Bracket at the bows, whilst they are spaced apart amidships by two 5½″ Strips fixed to the 5½″ × 2½″ Flanged Plate, as can be seen in Fig. 6.

The bridge comprises one 2½″ × 1″ and two 2½″ × ½″ Double Angle Strips, the complete assembly being secured to a Double Bent Strip. This, in turn, is fixed to a 2½″ Strip that is attached to the side plates of the model by Angle Brackets. A Crank bolted to the Strip supports an Axle Rod representing the mast. The wheel 5 (a 1″ Pulley) is mounted by its tapped hole on the end of a ¾″ Bolt passed through the floor of the bridge, while the binnacle is represented by a Collar mounted on a Threaded Pin.

Eight 2½″ Strips and eight 2½″ × ½″ Double Angle Strips are bolted to a 1½″ Pulley and a Bush Wheel to form the funnel, which is secured in place by the Double Bracket 2. The top hole of this Double Bracket forms a support for the lower end of the steam escape pipe, which is held in place by a bolt passed through one of the Double Angle Strips and inserted in the tapped hole of the Collar.

(*Continued on page 308*)

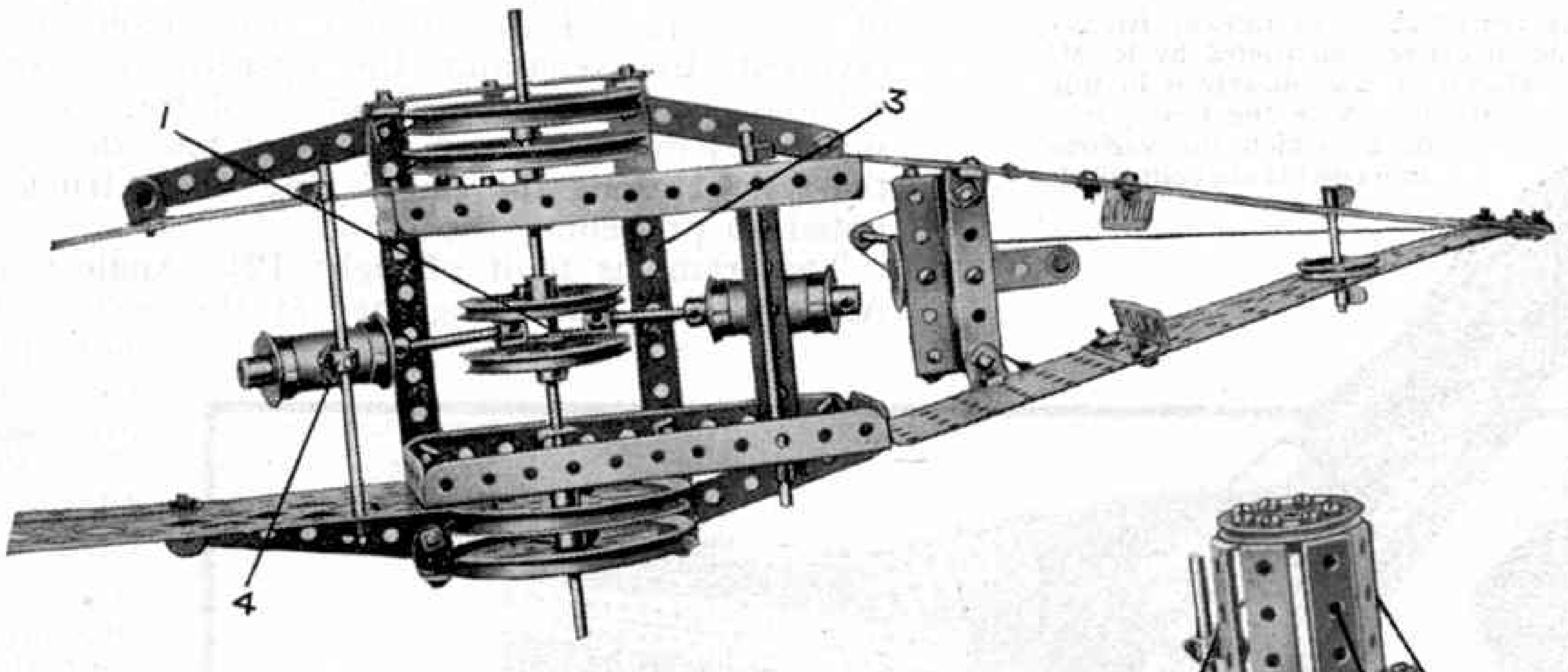


Fig. 6. Underneath view of model Paddle Steamer, showing the method of coupling the oscillating cylinders to the crankshaft.

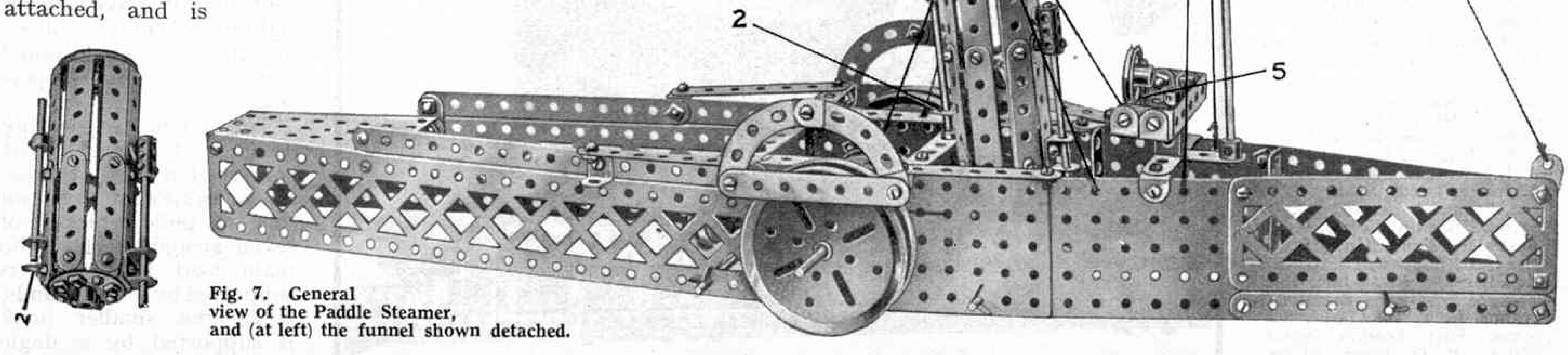


Fig. 7. General view of the Paddle Steamer, and (at left) the funnel shown detached.

Results of
Meccano Model-Building Contests
By Frank Hornby

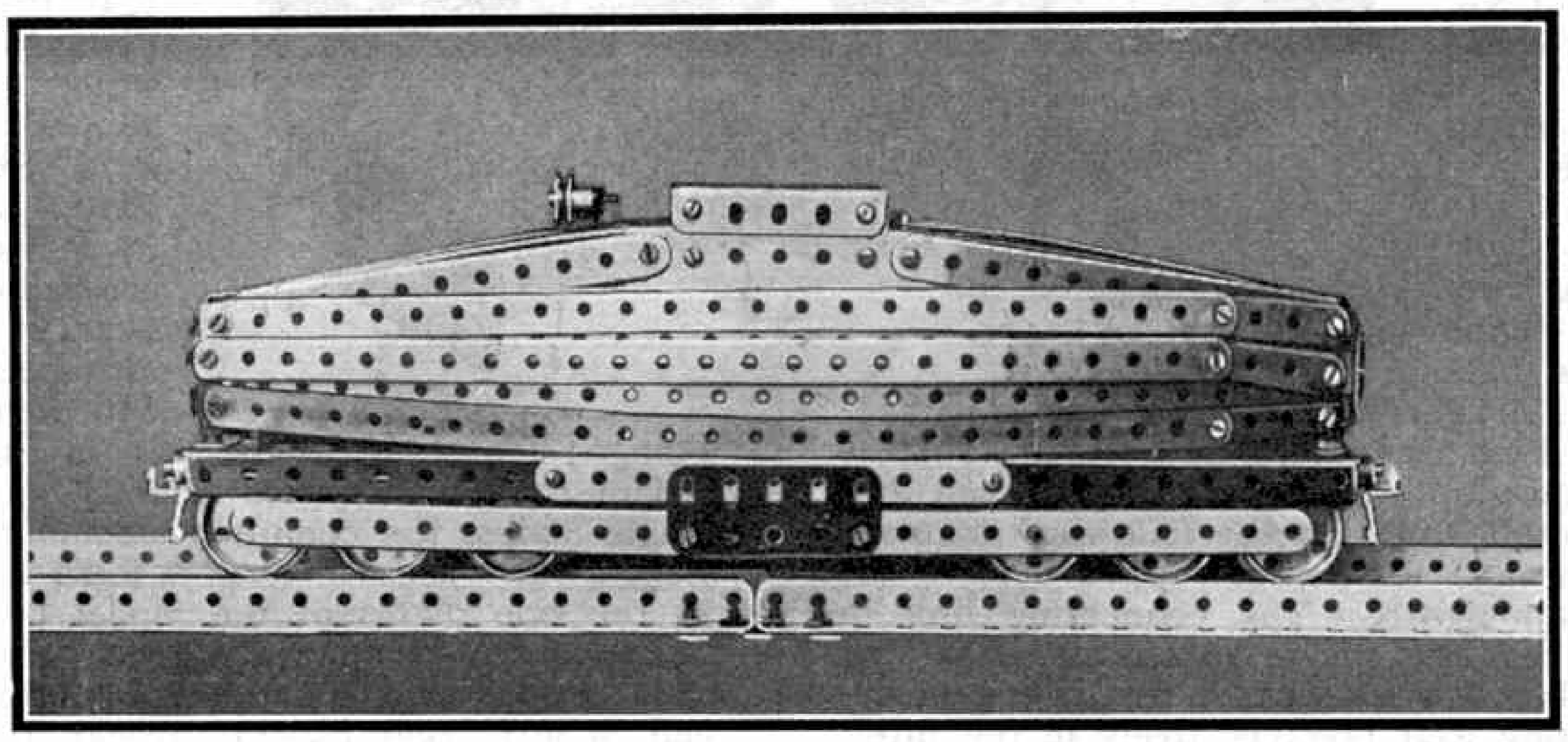
"Autumn" Competition (Overseas Section)

THE Overseas Section of the "Autumn" Contest brought a great response from Meccanoites residing in all parts of the world. The entries received are of a remarkably high standard and very creditably maintain the reputation of Meccano model-builders abroad. The names of the prize-winners are as follows:—

First Prize, Cheque for £3-3s.: E. F. Cullaré, Barcelona, Spain. Second Prize, Cheque for £2-2s.: R. M. Highland, Kenmore, N.Y., U.S.A. Third Prize, Cheque for £1-1s.: G. L. Vollmer, St. Catherines, Ontario, Canada.

Six Prizes, each consisting of Meccano products to value 10/6: G. R. Nisbet, Mont Albert, E.10, Melbourne, Australia; R. Wallace, Durban, Natal, S. Africa; F. Pantanella, Rome, Italy; R. Frey, Barcelona, Spain; J. Laskaris, Athens, Greece; J. Vincent, Nantes, France.

Twelve Prizes, each consisting of Meccano products to value 5/–: J. Villeneure, Montreal, Canada; P. L. Bargellini, Florence, Italy; F. Hawke, Witbank, Transvaal, South Africa; R. Brenni, Mendrisio, Switzerland; J. A. Bakker, Hilversum, Holland; P. Begemann, Semarang, Java, D.E.I.; John O'Connor, Killara, Sydney, Australia; E. Larsen, Buenos Aires, Argentine; G. Hugel, Mulhouse, Haut Rhine, France; F. E. N. Tuck, Hamilton, New Zealand; B. Dubinsky, Rome, Italy; Tom Walker, Westmount, Montreal, Canada.



J. Laskaris secured a Prize with this neatly constructed model of an Electric Locomotive of the future.

Twelve Prizes, each consisting of a copy of "Famous Trains" by C. J. Allen: N. B. Scott, Winnipeg, Manitoba, Canada; A. E. Pilgrim, Leederville, Perth, Australia; W. D. Segaar, den Haag, Holland; Hans Probst, Basel, Switzerland; R. Harman, Ryde, Sydney, Australia; H. Robertson, Wellington, New Zealand; L. Wild, Turin, Italy; G. Ormsby, Johannesburg; E. Smith, Montreal, Canada; R. K. Choksi, Karachi. India; T. Morato, Barcelona, Spain; A. S. Adams, Natal, South Africa.

Twelve Prizes, each consisting of a Meccano "Engineer's Pocket Book'': Jack Soushern, Kew, E.4, Victoria, Australia; M. Galvez, Toledo, Spain; G. P. Keller, Stratford, New Zealand; T. MacLachlan, Dunedin, Otago, New Zealand; E. Webb, New Brighton, Christchurch, New Zealand; M. Wills, Sydney, Australia; E. S. Monk, Roseville, Sydney, Australia; E. R. Davis, Winnipeg, Canada; H. Alington, Temuka, South Canterbury, New Zealand; L. E. Pignocchi, Cordoba, Argentine; A. Rapp, Hobart, Tasmania; G. E. Schubz, Coromby, Victoria, Australia.

Special Commendation (Certificate of Merit): R. J. Henry, Taber, Alta, Canada; R. Longstaff, Blenheim, New Zealand; W. Nijenhuis, Arnhem, Holland; A. Galvez, Toledo, Spain; P. C. Put, Friesland, Holland; J. B. Tyson, Millswood Estate, South Australia; Bruce Hutt, Primrose East, Transvaal, S. Africa; H. Uiterwijk, Rotterdam, Holland; M. Edsavarria, Barcelona, Spain; R. T. W. Clarke, Selborne, East London, South Africa; R. O. Jukes, Christchurch, New Zealand; G. F. Morgan, Wellington, New Zealand; E. Castellano, La Plata, Argentine; A. E. Foglia, Buenos Aires, Argentine; P. Anagnostopoulos, Athens, Greece; W. Tweddell, Toronto, Canada; J. Gascon Peres, Madrid, Spain; C. Baineras, Barcelona, Spain; E. J. S. Tait, Durban, Natal, South Africa; E. Cooper, Mt. Eden, New Zealand; W. Bolitho, Castle Hill, Via Parramatta, N.S.W.; B. Carnson, Capetown, S. Africa.

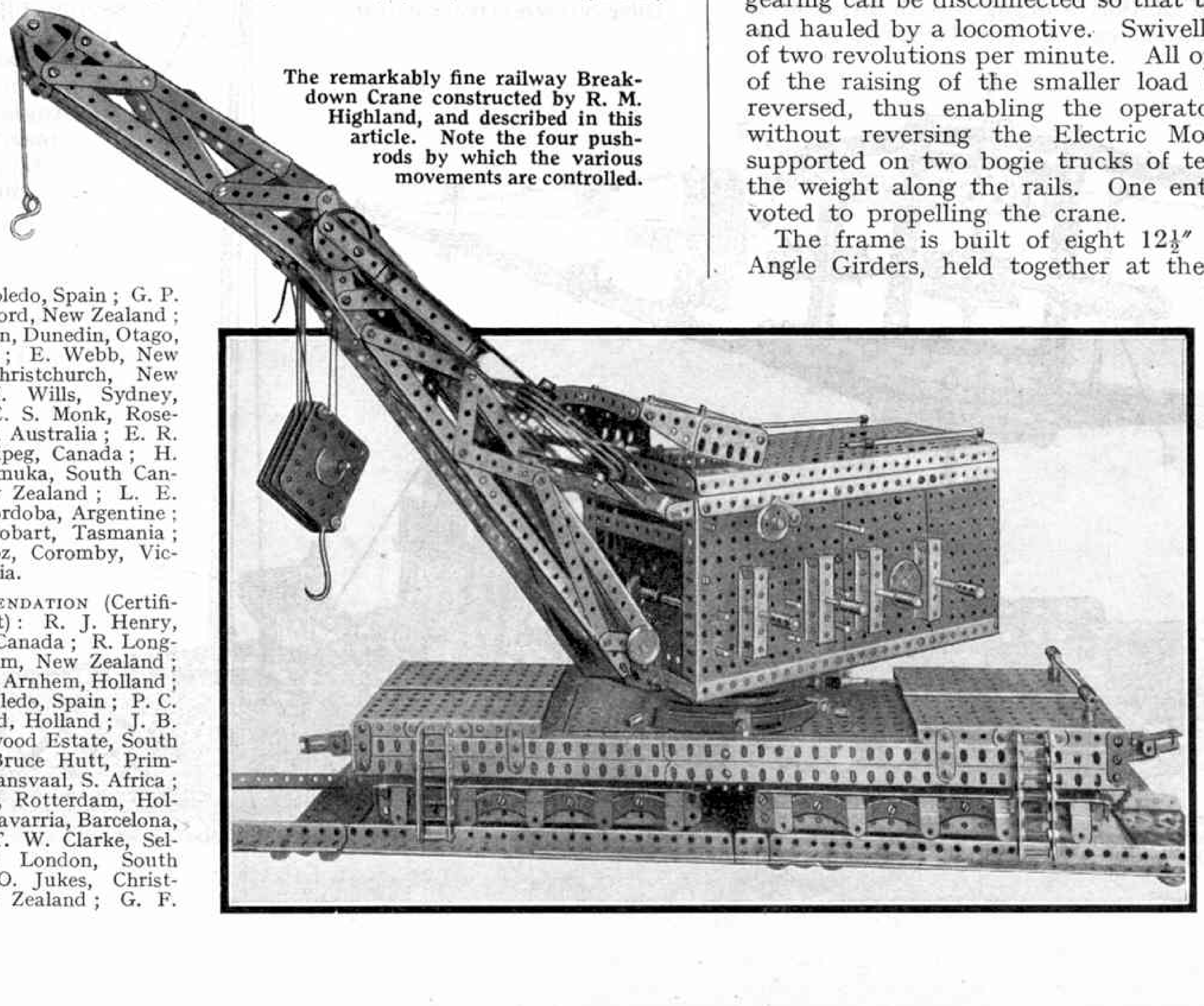
The First Prize was secured by E. F. Cullaré with a model of more than usual interest, but as it is my intention to describe this entry fully in a special article later, I will not now go into constructional details. I may say, however, that it is a splendid representation of a lighthouse complete with a very ingenious revolving electric lamp and power house. I think the model will appeal to all Meccano enthusiasts and the article will appear in the "*M.M.*" as early as possible.

Robert M. Highland carried off the Second Prize with the fine model of a railway breakdown crane illustrated herewith. The crane represented is of 200 tons capacity. Some idea of the imposing dimensions of the model will be gained from the following specification: length, overall, 38 inches; width, 5½ inches; weight, 20½ lbs.; length of frame, 21½ inches; length of cab, 12½ inches. It will be noticed that the model has two load hooks, either of which can be operated independently of the other.

The model travels under its own power, or, alternatively, the gearing can be disconnected so that the crane may be attached to and hauled by a locomotive. Swivelling is carried out at the rate of two revolutions per minute. All operations, with the exception of the raising of the smaller load hook, may be mechanically reversed, thus enabling the operator to carry out manœuvres without reversing the Electric Motor. The superstructure is supported on two bogie trucks of ten wheels each, which divide the weight along the rails. One entire truck (ten wheels) is devoted to propelling the crane.

The frame is built of eight 12½″ Angle Girders and four 5½″ Angle Girders, held together at the corners by four 1½″ Angle Girders. Both the top and the bottom of this frame are filled in by alternated Flat Plates and Flanged Plates, reinforced by Angle Girders. The rotary base is a standard Meccano mechanism (No. 136) except that it makes use of eight instead of four rollers, in order to give additional support to the superstructure.

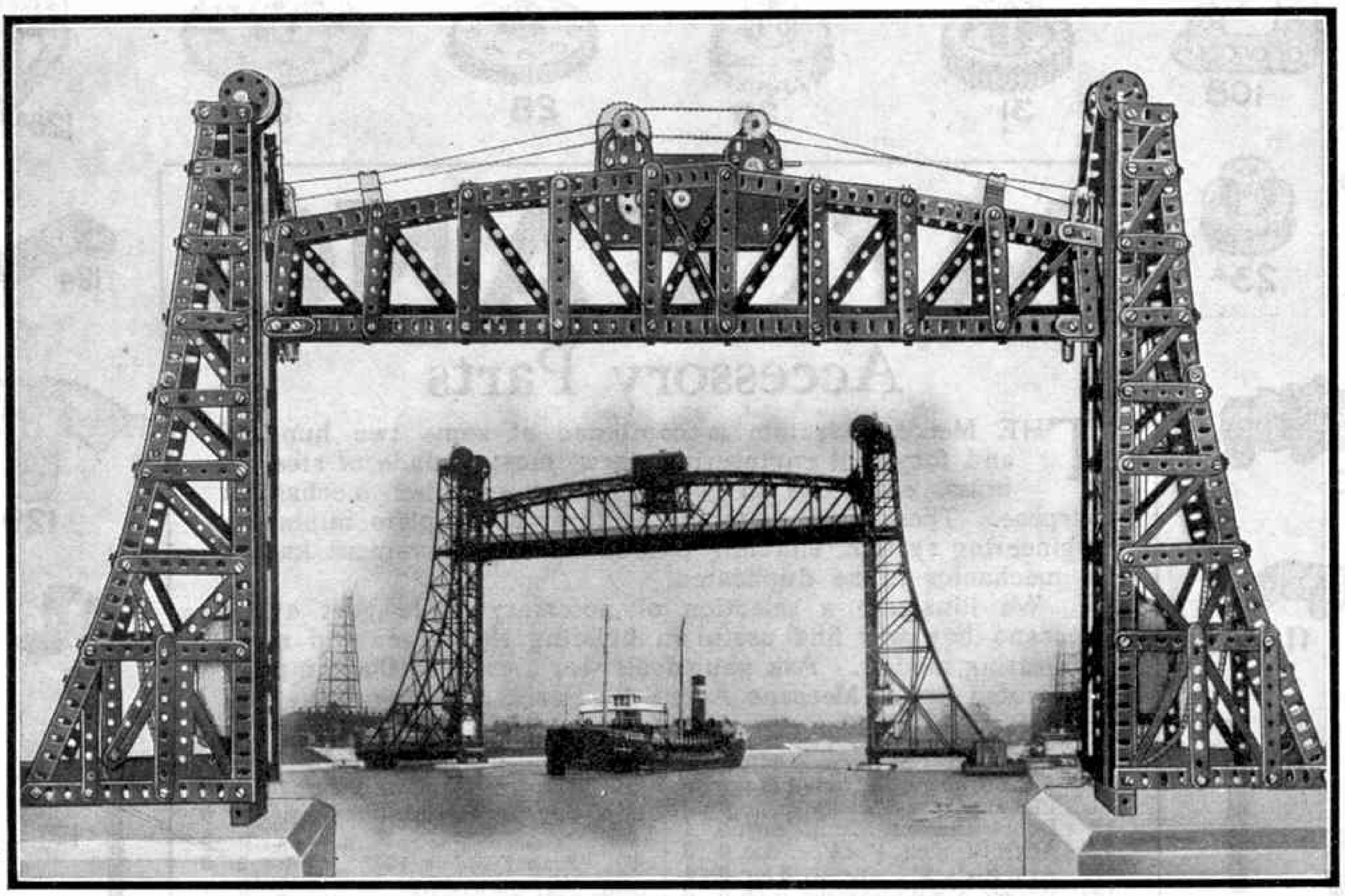
The boom is specially designed to resist great compression and torque. It is supported by two sets of pulley blocks of seven strands each. The main load hook also is supported by seven strands, while the smaller hook is supported by a single strand. The windlass



The remarkably fine railway Breakdown Crane constructed by R. M. Highland, and described in this article. Note the four push-rods by which the various movements are controlled.

operating the main load hook and boom is controlled from the main driving shaft, and a separate windlass is provided for raising or lowering the smaller hook. The drive from the Electric Motor is transferred to the main driving shaft through worm gearing at a ratio of 57 : 1. This shaft runs the full length of the cab and all clutches operate from it, directly or indirectly.

The model is exceptionally well built and reflects great credit on its builder, who writes that he has built his model entirely from his own conception of what a 200-ton breakdown crane should be. In the United States, of course, high capacity railway cranes are necessitated by the gigantic locomotives in operation in that country. In Great Britain, the most powerful breakdown cranes seldom have a load capacity exceeding 80 to 100 tons, this being quite sufficient to meet any emergency.



A composite picture showing Bridge No.14 over the Welland Ship Canal, Ontario, Canada, together with the splendid Meccano model of the bridge built by G. L. Vollmer.

Although there is no more fascinating branch of engineering, perhaps, than that of bridge building, I seldom find really good examples of this class of work amongst competition entries. The "Autumn" Contest, however, produced a remarkably fine specimen of the bridge builder's art. The model I have in mind is that constructed by G. L. Vollmer and shown in the accompanying illustration. The prototype of the model is bridge No. 14 over the Welland Ship Canal, Ontario, and it will be seen from the illustration that it is of the vertical lifting type, a design that is very useful when it is desired to cross a busy river or canal, and where the expense and inconvenience of constructing long approaches vetos the more ordinary girder or suspension bridge.

The model is operated from a Meccano Motor, the drive from which is transmitted through Sprocket Chains to the winding drums situated in the centre of the span. The winding ropes are fastened at the tops of the towers, led round a Pulley at each end of the span, and thence round the winding drums. They are then returned over further Pulleys at the ends of the span and finally secured to points in the bases of the towers. Heavy weights move up and down the towers to balance the moving portion of the roadway. The model shows admirably the excellent work that can be done in this direction and I would like to see more Meccano boys trying their hand at bridge building.

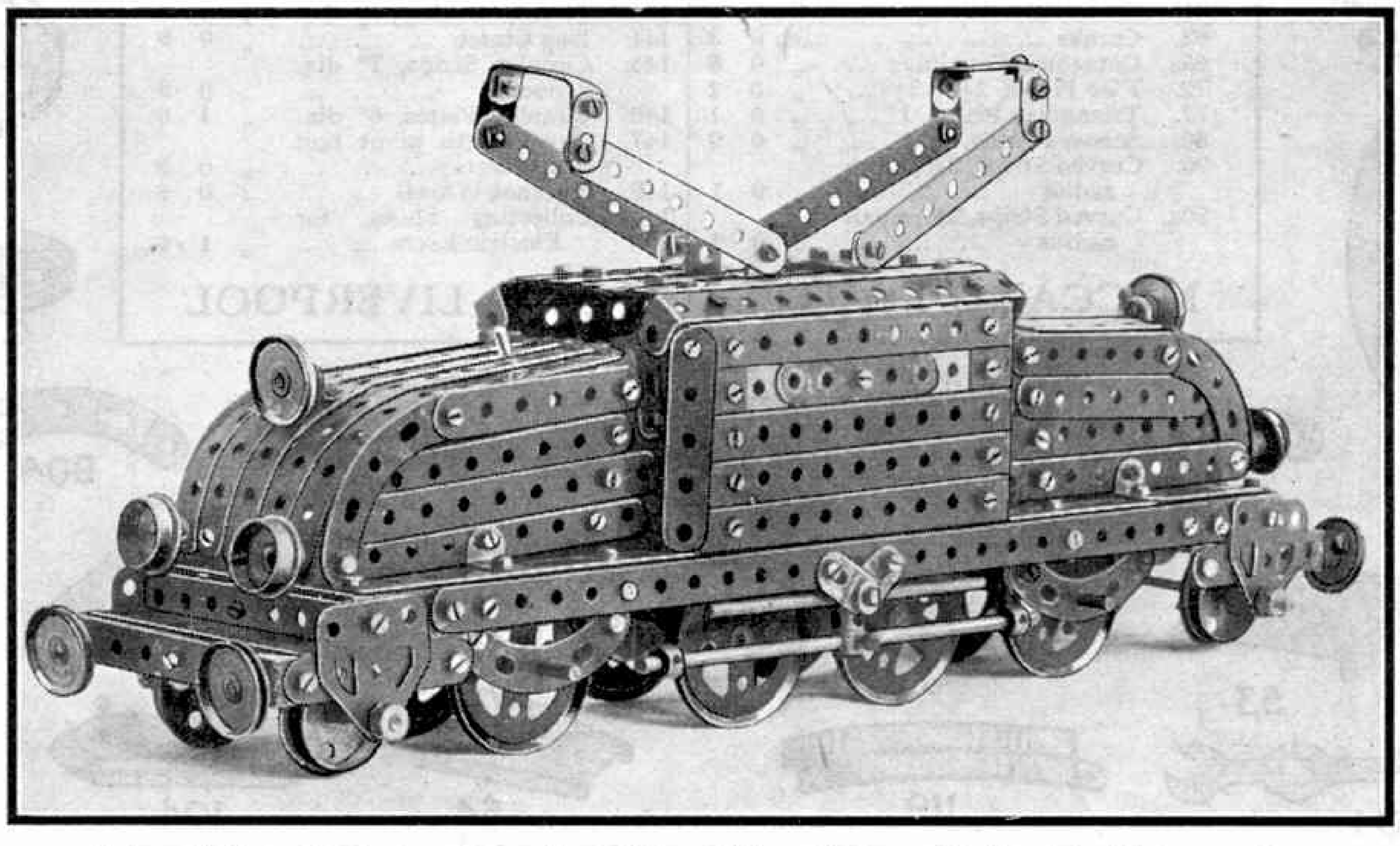
R. Wallace submitted an interesting model of a "Cletrac" agricultural tractor. The model is closely identified in every detail to the actual machine and it has been highly commended by the makers of the "Cletrac" tractors, by whom it was exhibited at the Durban Agricultural Show.

The chassis of the model is made up from four 9½″ Angle Girders, and is 3½″ in width. A gear box provides two speeds forward and one reverse. An interesting feature is a differential gear that is provided to facilitate steering. On turning the steering wheel, one side of the differential and its corresponding "caterpillar" is slowed down by means of a cord passing round a 1″ Pulley Wheel on the differential shaft and acting as a brake. The real "Cletrac" tractors are steered in this manner. The caterpillar track is kept taught by means of four compression springs, two acting on each front wheel axle, which is free to slide in its bearings. Each shoe of the track comprises a 1½″ Flat Girder, and each track comprises twenty-three complete shoes. The drive is led through a big reduction gear in order to provide sufficient power to overcome the friction created by the tracks, and in a test "hill climb" the tractor went up a gradient of 1 in 2½, and also clambered over various obstacles placed in its path.

G. R. Nisbet chose a 0–6–2 type shunting locomotive of the Victorian Railways as the subject of his model. It is driven by a 4-volt Electric Motor geared down at a ratio of 27 : 1, the power being transmitted to the rear pair of drivers by means of Sprocket Chains neatly arranged inside the main frame.

Various travelling speeds may be obtained by moving the "regulator," which is built up from a Crank and Threaded Pin fastened to a 1″ Rod that passes through the Plates forming the front of the cab. The Rod is connected to the arm of a Resistance Controller, so that on moving the regulator the arm of the Controller also is moved, thus altering the speed of the Motor. A 4-volt 8 ampere-hour Accumulator accommodated in the tender supplies current to the Motor.

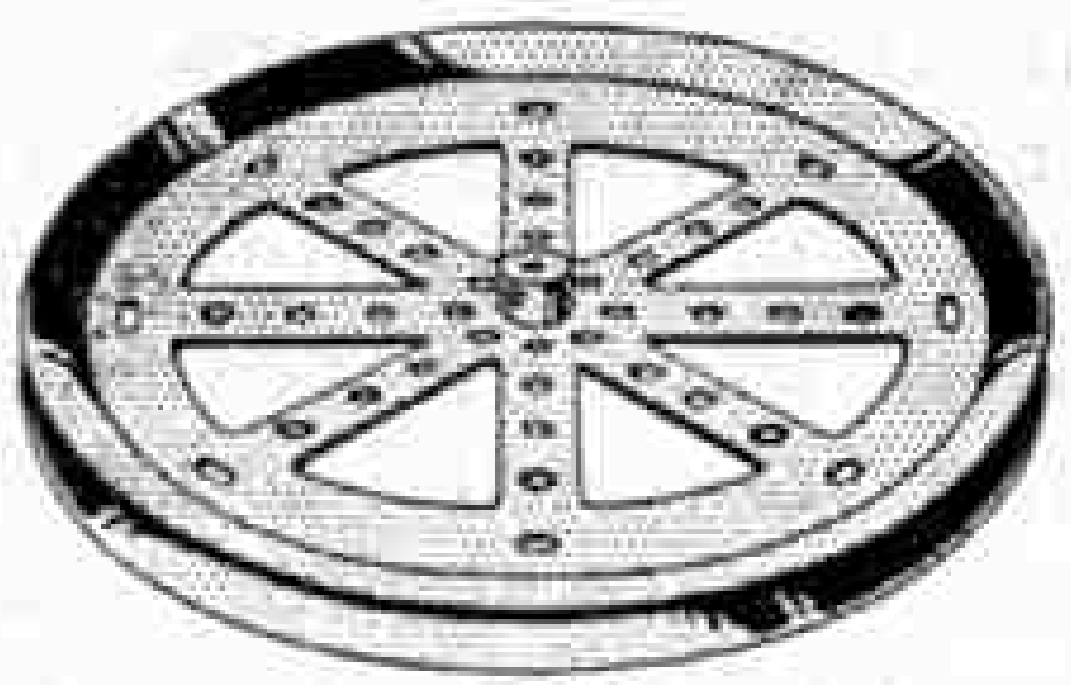
Brakes consisting of 3″ Strips are fitted to each of the three coupled wheels. The brakes are connected in pairs by 4½″ Rods running across the chassis and the pairs are linked together by 9½″ Strips. To the centre of the rearmost 4½″ Rod a 1½″ Strip is pivoted and is connected by means of a bolt and lock-nuts to a 2½″ Strip that, in turn, is bolted to one arm of a Boss Bell Crank. This Crank swings around a 4½″ Rod and to its other arm is attached a Threaded Boss through which a 3½″ Threaded Rod is passed. Rotation of this Rod either withdraws or applies the brakes.



Raimondo Brenni gained a prize as the builder of this realistic model of an Electric Locomotive.

J. Laskaris constructed an "electric locomotive of the future." The model, which is shown in one of the accompanying illustrations, is driven by an Electric Motor placed in the interior of the torpedo-shaped body, and the current supply is taken from a third rail by means of a collecting shoe.

An electric locomotive also formed the subject of the entry from R. Brenni and this model also is reproduced.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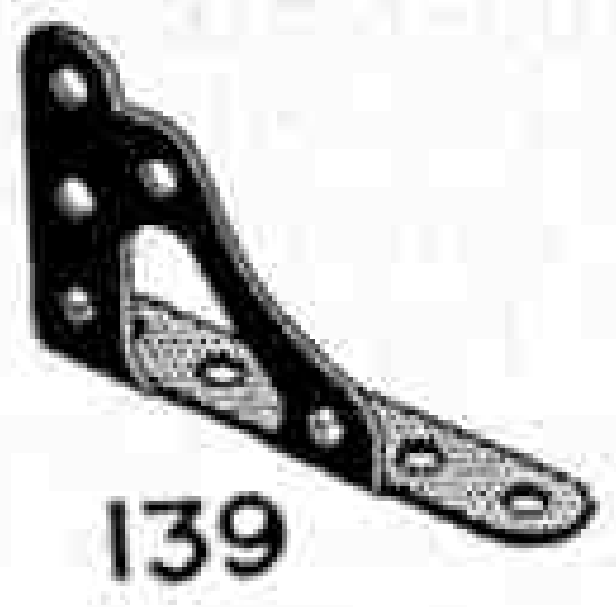
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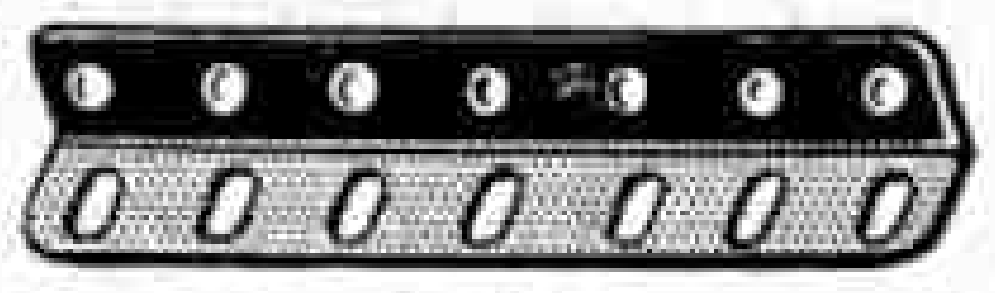
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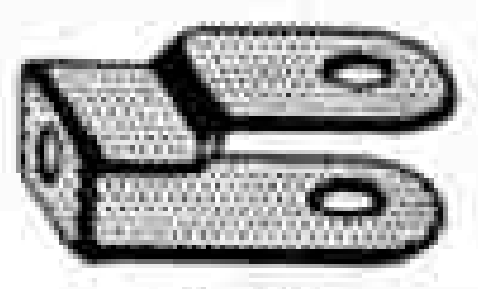
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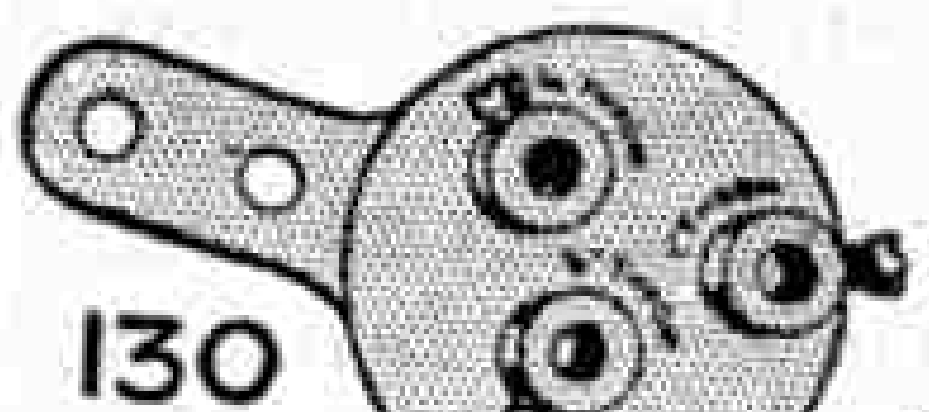
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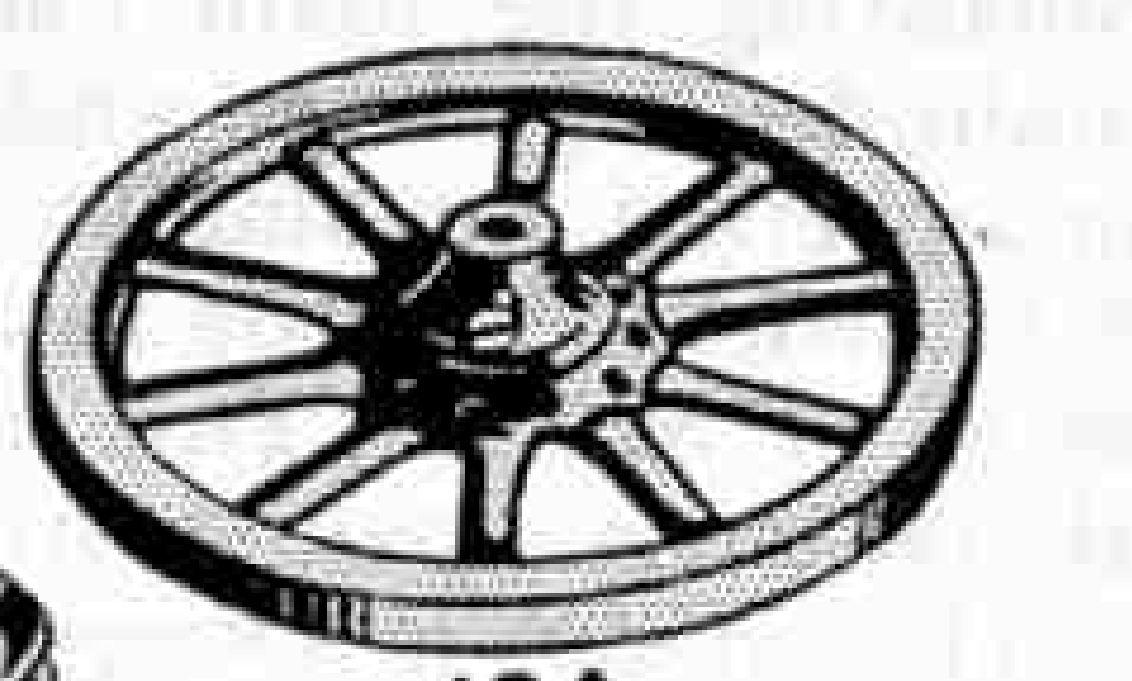
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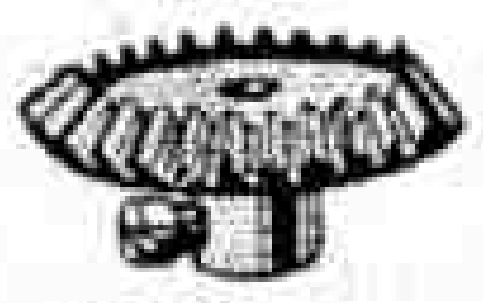
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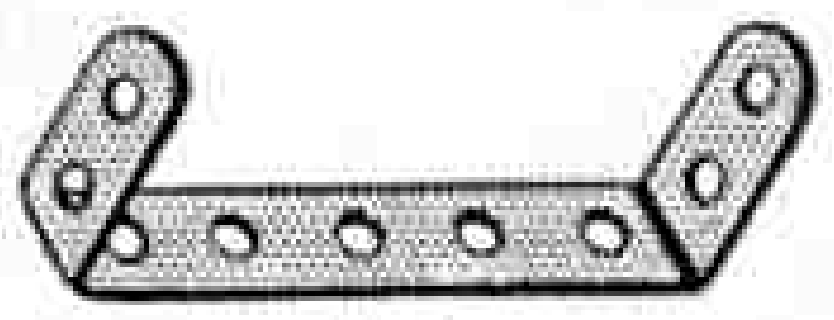
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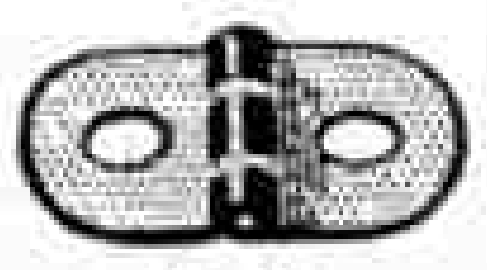
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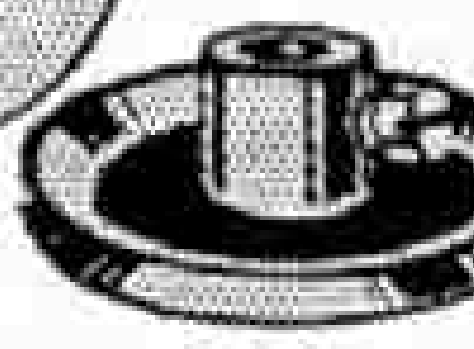
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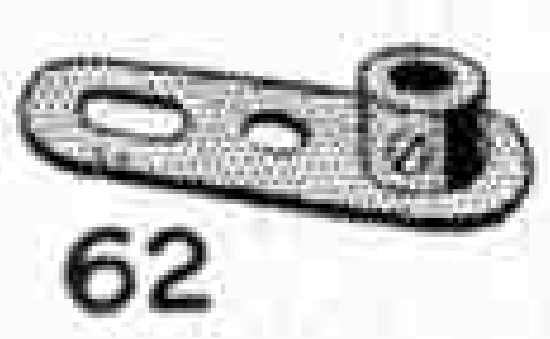
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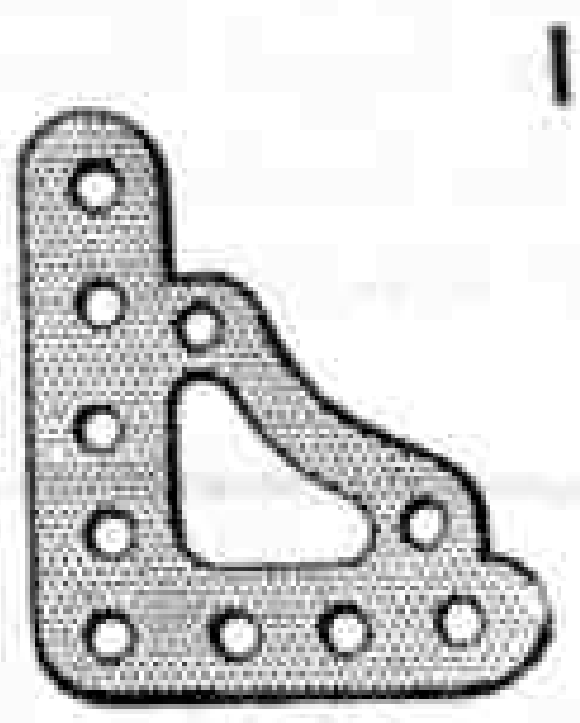
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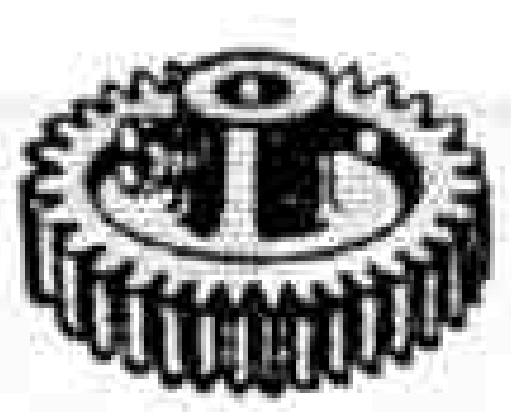
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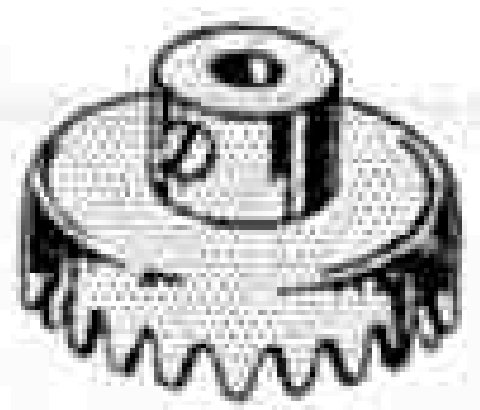
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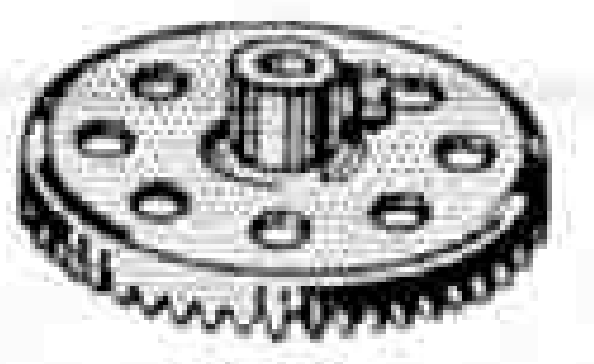
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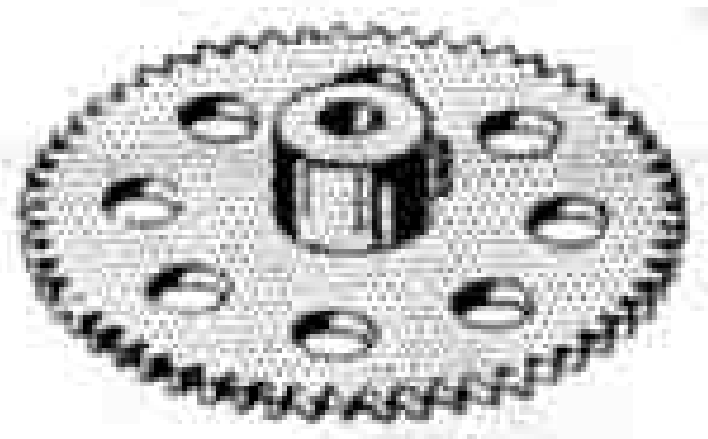
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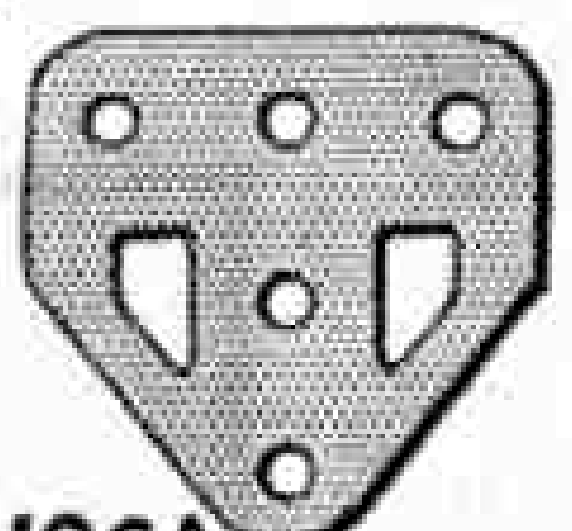
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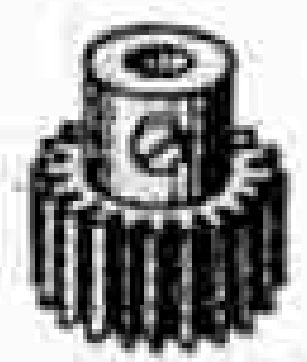
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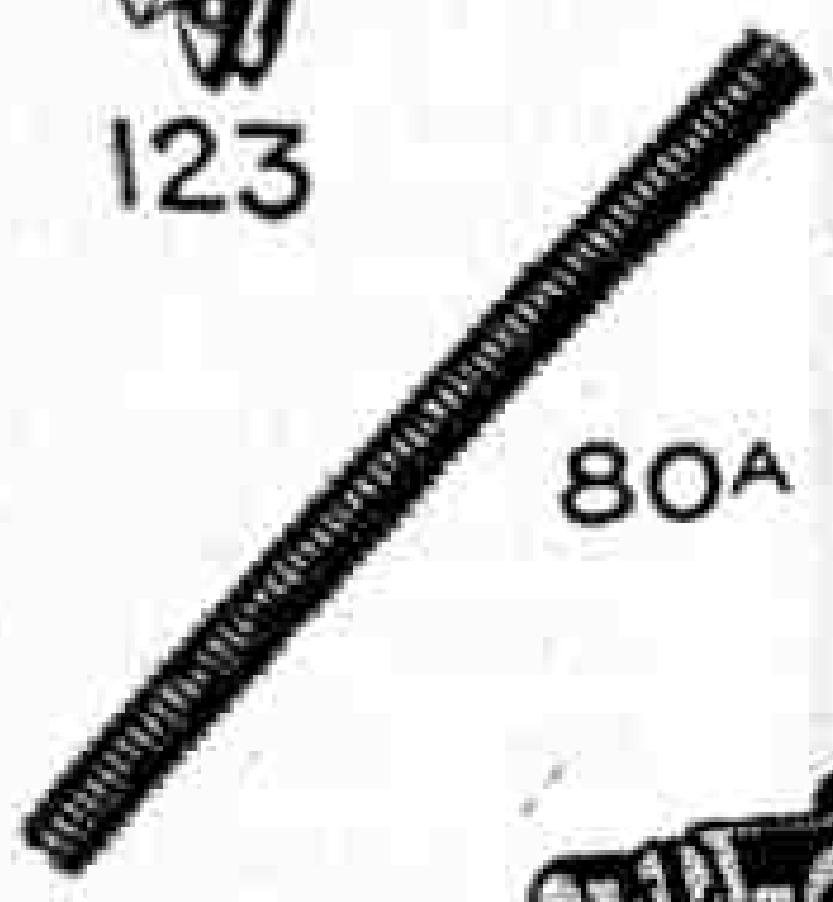
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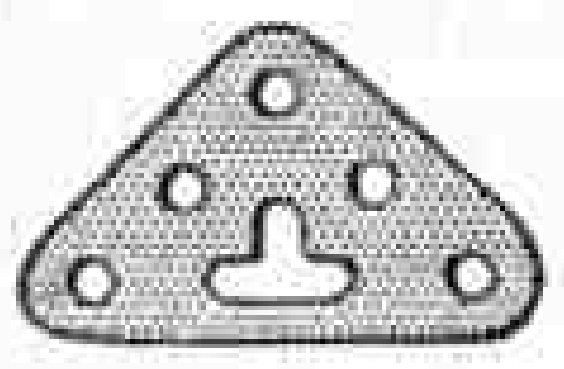
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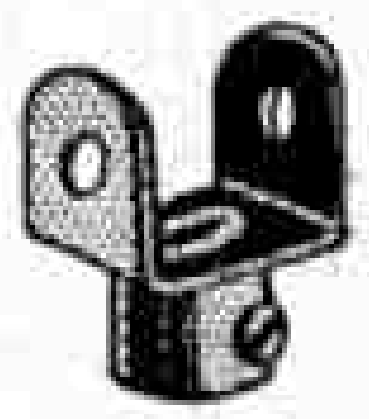
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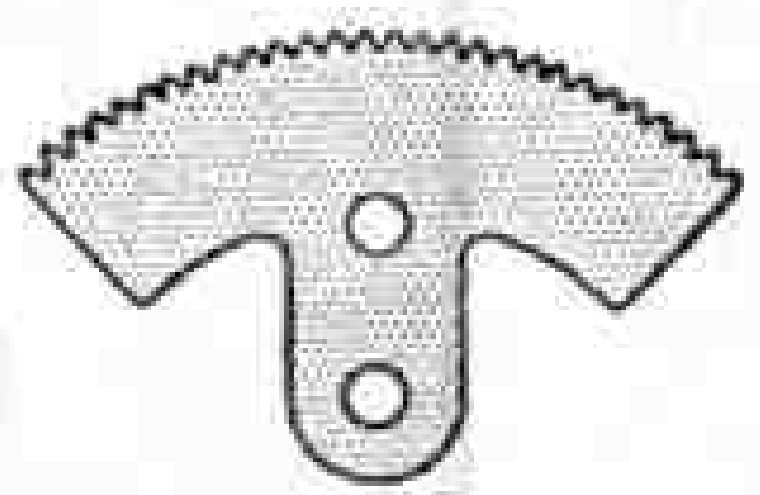
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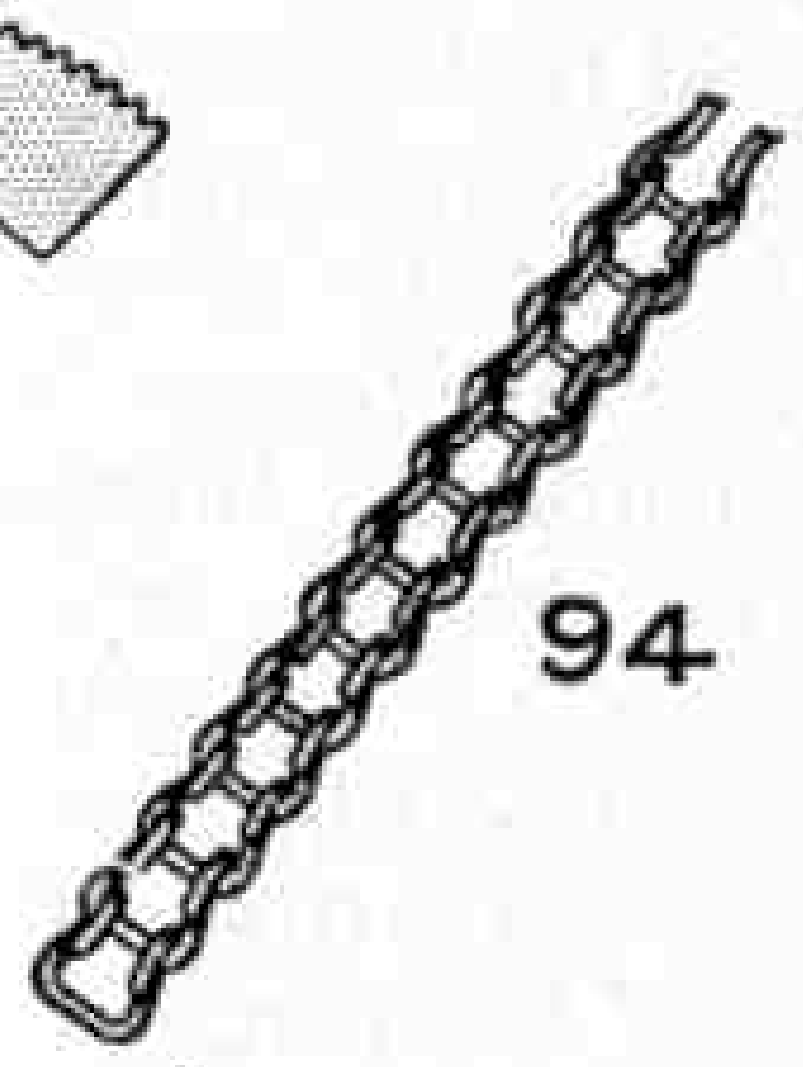
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MECCANO

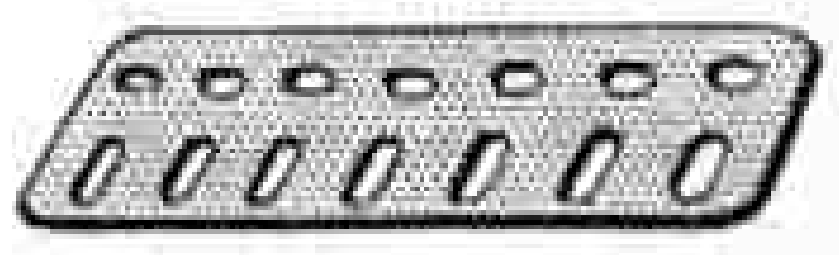
Accessory Parts

THE Meccano system is composed of some two hundred and fifty real engineering parts, mostly made of steel or brass, each one of which has a specified mechanical purpose. These parts combine to form a complete miniature engineering system, enabling practically any movement known in mechanics to be duplicated.

We illustrate a selection of accessory parts that every Meccano boy will find useful in building the larger and more interesting models. Ask your dealer for a copy of the complete illustrated list of Meccano Accessory Parts, and keep it by you for reference.

No.		s.	d.
9b.	Angle Girders, 3½″ long ½ doz.	0	8
10.	Flat Brackets … … ”	0	2
11.	Double Brackets … … each	0	1
12.	Angle Brackets, ½″ × ½″ doz.	0	3
17.	Axle Rods, 2″ … … 3 for	0	1
19a.	Wheels, 3″ with set screw each	0	6
	Pulley Wheels		
19c.	6″ dia. with centre boss and set screw … … ”	2	0
22.	1″ ” ” … … ”	0	3
22a.	1″ without set screw … ”	0	2
23a.	½″ ” ” … ”	0	3
26.	Pinion Wheels, ½″ diam. ”	0	4
27.	Gear Wheels, 50 teeth ”	0	6
27a.	” ” 57 ” ”	0	6
28.	1½″ Contrate Wheels … ”	0	9
29.	¾″ ” ” … ”	0	6
30.	Bevel Gears, ⅞″ 26 teeth ”	0	9
31.	1″ Gear Wheels, 38 teeth ”	1	0
34.	Spanners … … … ”	0	2
35.	Spring Clips … per box doz.	0	3
43.	Springs … … … … each	0	2
44.	Cranked Bent Strips … ”	0	1
45.	Double Bent Strips … ”	0	1
46.	Double Angle Strips, 2½″ × 1″ … … … ½ doz.	0	6
52.	Perforated Flanged Plates, 5½″ × 2½″ … … … each	0	5
53.	Perforated Flanged Plates, 3½″ × 2½″ … ”	0	3
54.	Perforated Flanged Sector Plates … … ”	0	3
61.	Windmill Sails … … 4 for	0	6
62.	Cranks … … … … each	0	3
63a.	Octagonal Couplings … ”	0	8
72.	Flat Plates, 2½″ × 2½″ … ”	0	2
77.	Triangular Plates, 1″ … ”	0	1
80a.	Screwed Rods, 3½″ … ”	0	3
90.	Curved Strips, 2½″, large radius … … … ”	0	1
90a.	Curved Strips, 2½″, small radius … … … ”	0	1
94.	Sprocket Chain … per length	0	6
95b.	Sprocket Wheels, 3″ dia. each	0	6
96.	” ” 1″ ” ”	0	3
99.	Braced Girders, 12½″ ” ½ doz.	2	6
103d.	Flat Girders, 3½″ … ”	0	7
104.	Shuttles, for Looms … each	7	6
106a.	Sand Rollers … … ”	1	9
108.	Architraves … … … ”	0	2
109.	Face Plates, 2½″ dia. … ”	0	4
114.	Hinges … … … per pair	0	4
116.	Fork Pieces … … … each	0	3
118.	Hub Discs, 5½″ dia. … ”	1	3
119.	Channel Segments (8 to circle), 11½″ dia. … ”	0	4
122.	Miniature Loaded Sacks ”	0	2
123.	Cone Pulleys … … ”	1	3
124.	Revsd. Angle Brackets, 1″ … … … … ½ doz.	0	4
126a.	Flat Trunnions … … each	0	1
127.	Simple Bell Cranks … ”	0	1
129.	Rack Segments, 3″ dia. ”	0	5
130.	Eccentrics, Triple Throw ”	1	0
133.	Corner Brackets … … ”	0	1
136.	Handrail Supports … ”	0	3
137.	Wheel Flanges … … ”	0	3
138.	Ship's Funnels … … ”	0	3
139.	Flanged Brackets, Right ”	0	2
140.	Universal Couplings … ”	0	10
142.	Rubber Rings, 3″ rim… ”	0	3
143.	Circular Girders, 5½″ dia. ”	1	0
144.	Dog Clutch … … … ”	0	6
145.	Circular Strips, 7″ dia. overall … … … ”	0	9
146.	Circular Plates, 6″ dia. ”	1	0
147.	Pawls, with pivot bolt and nuts … … … ”	0	3
148.	Ratchet Wheels … … ”	0	6
149.	Collecting Shoes, for Electric Locos … … ”	1	6

MECCANO LIMITED, Old Swan, LIVERPOOL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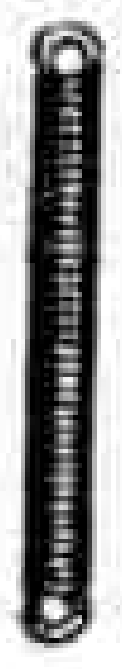
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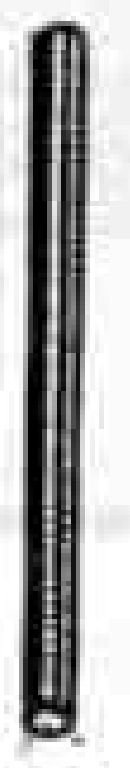
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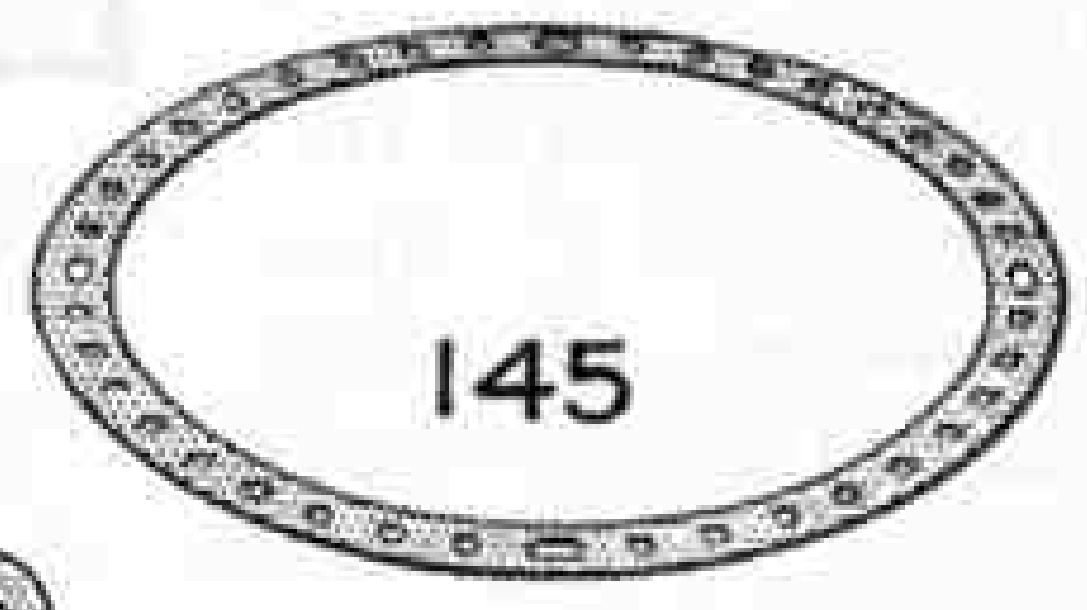
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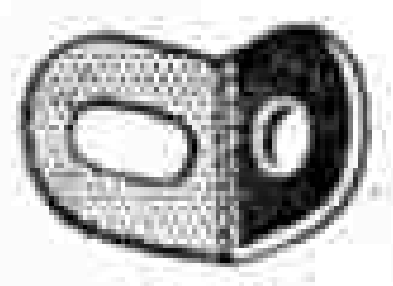
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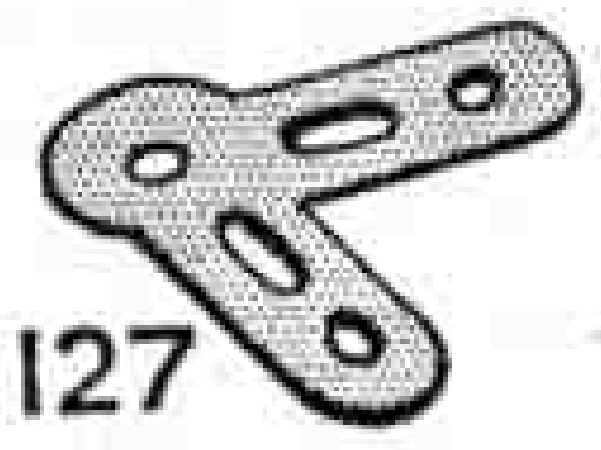
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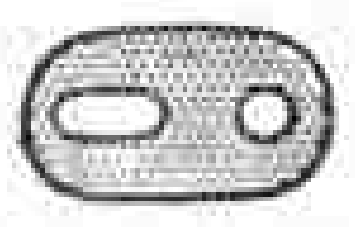
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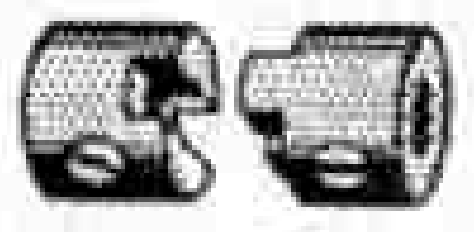
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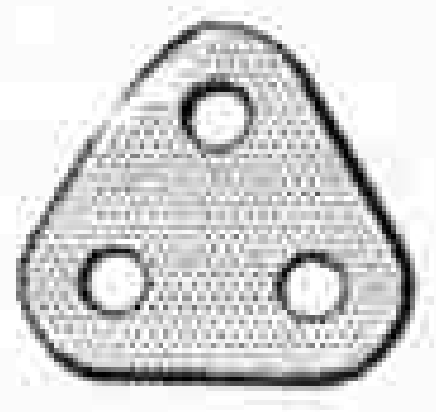
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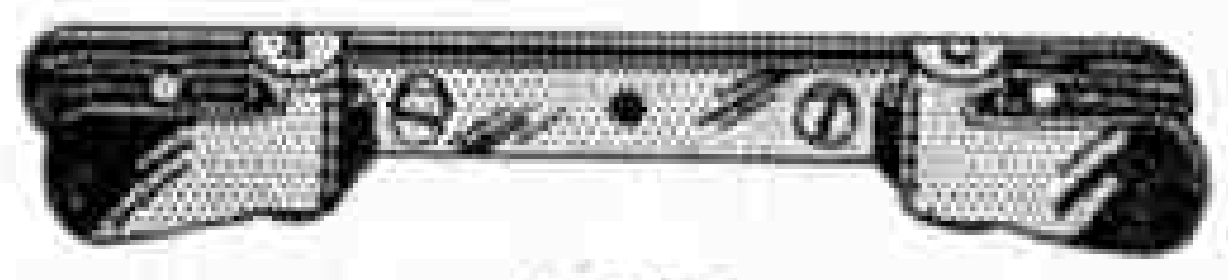
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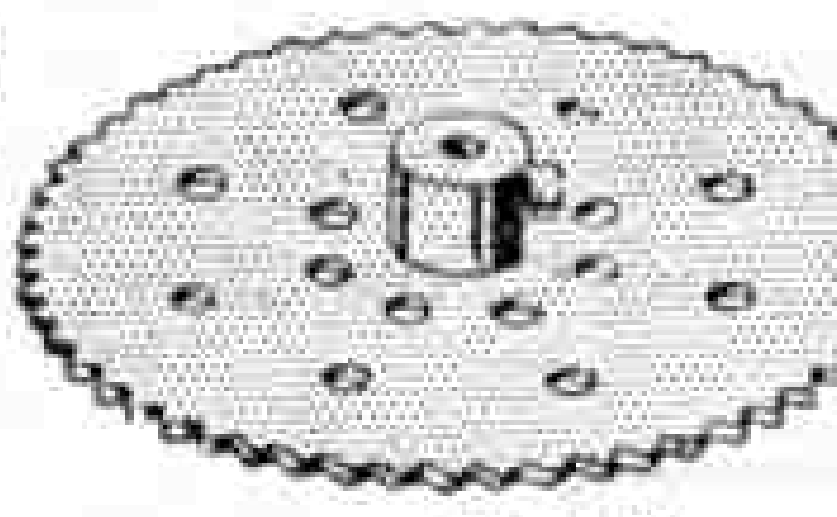
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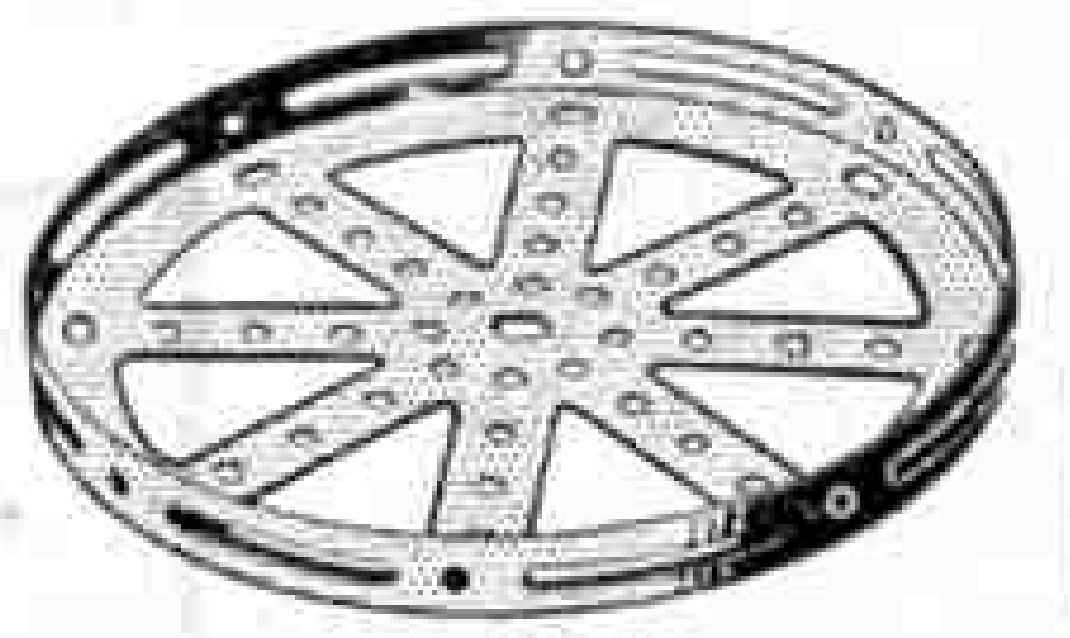
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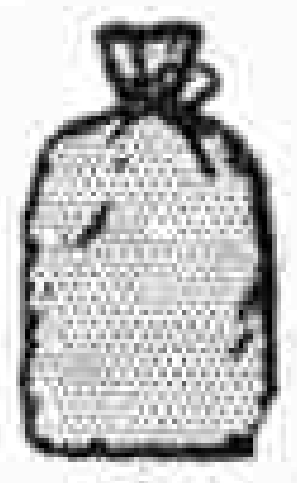
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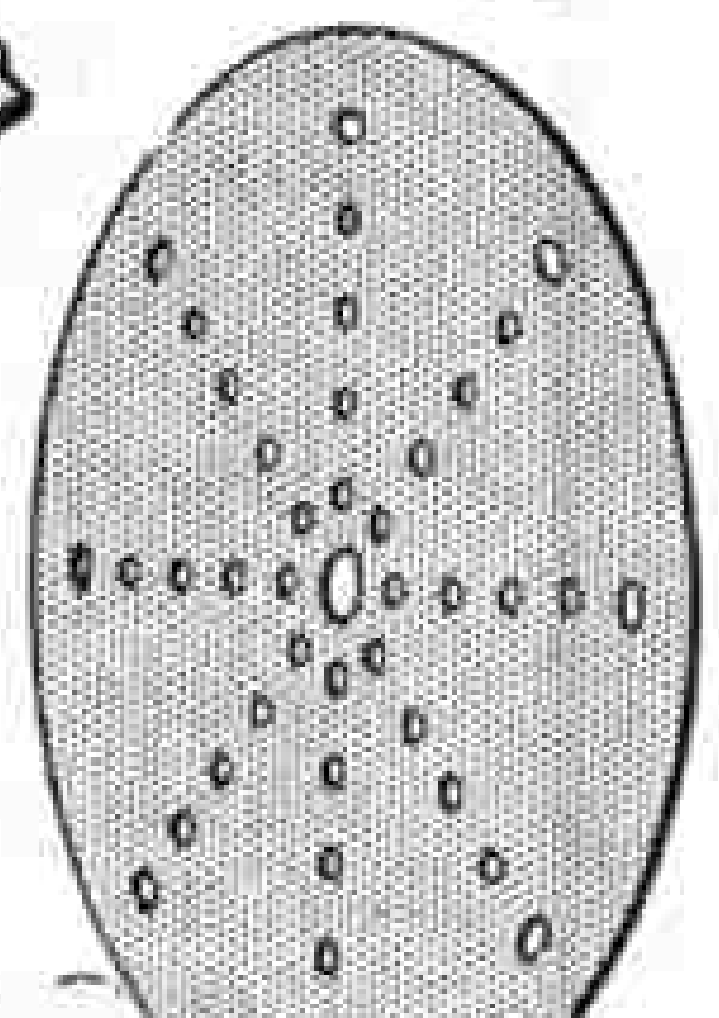
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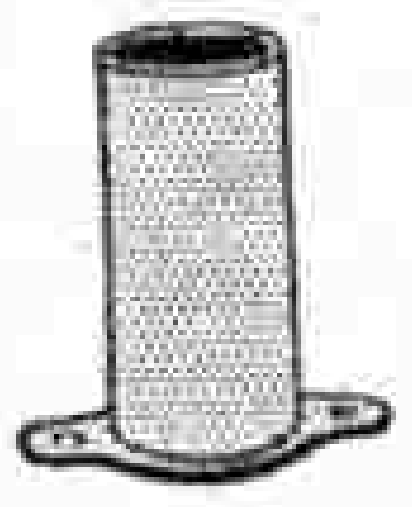
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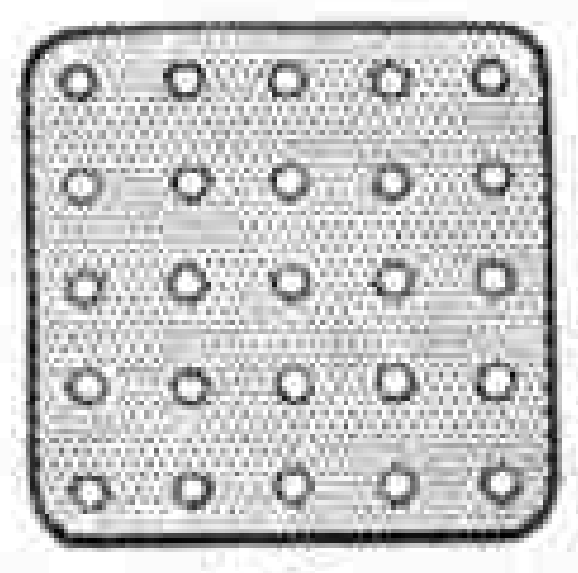
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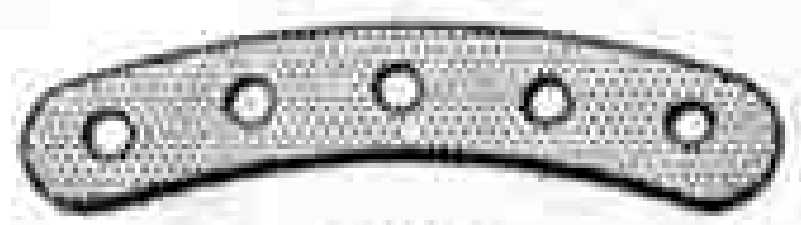
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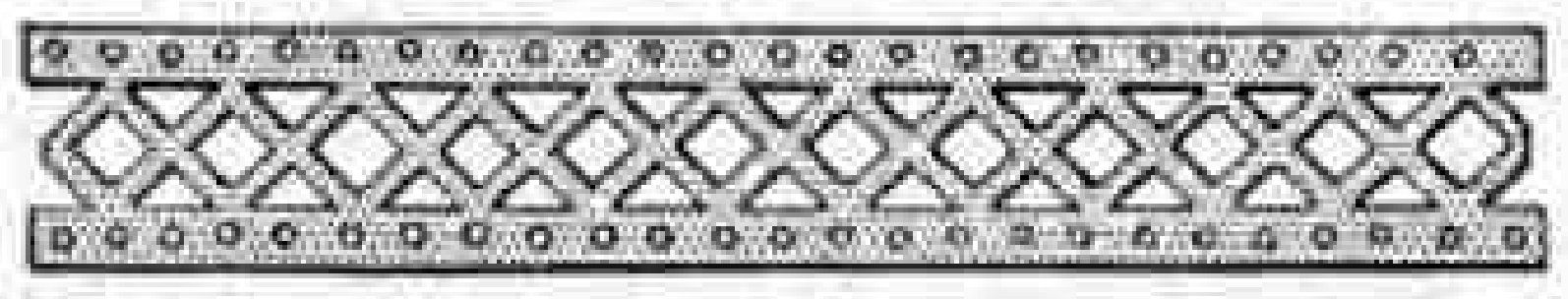
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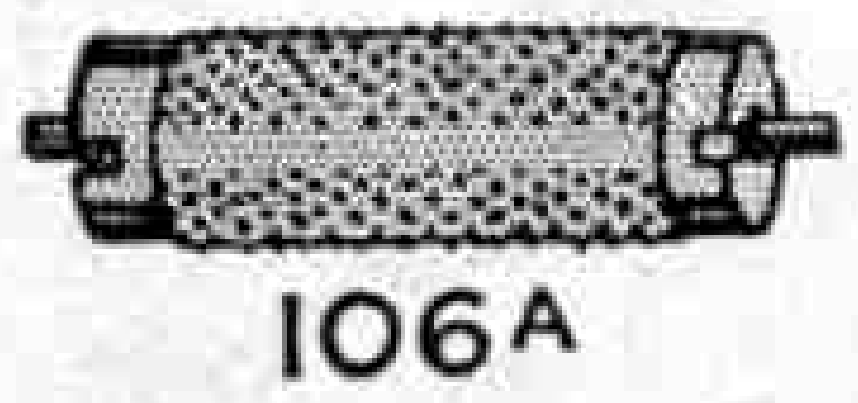
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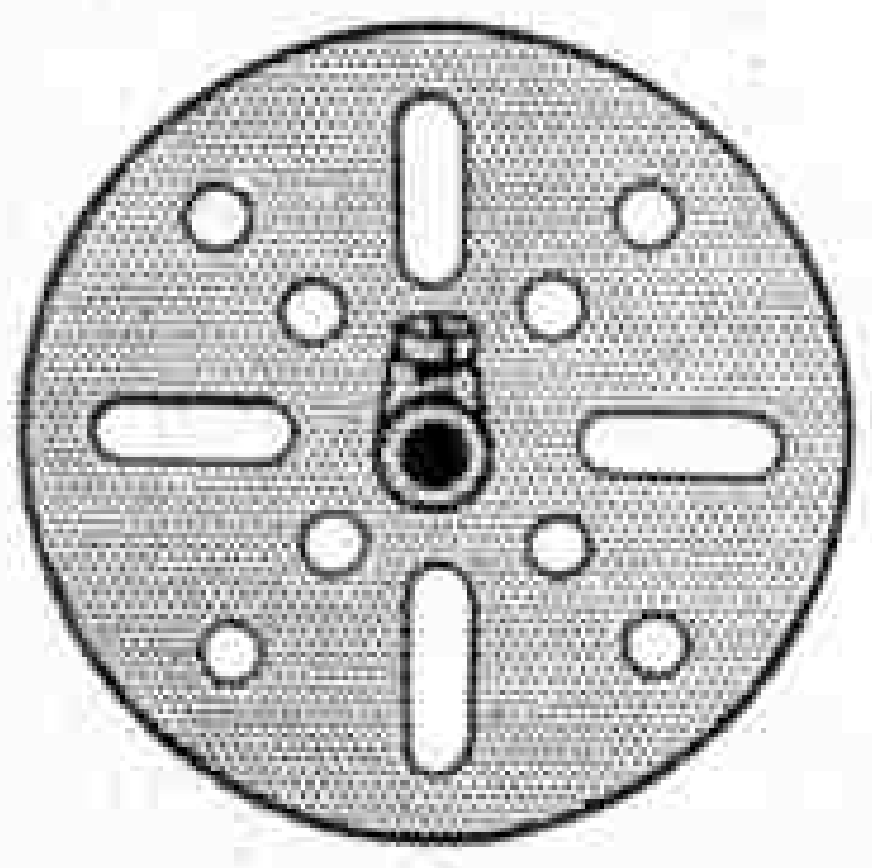
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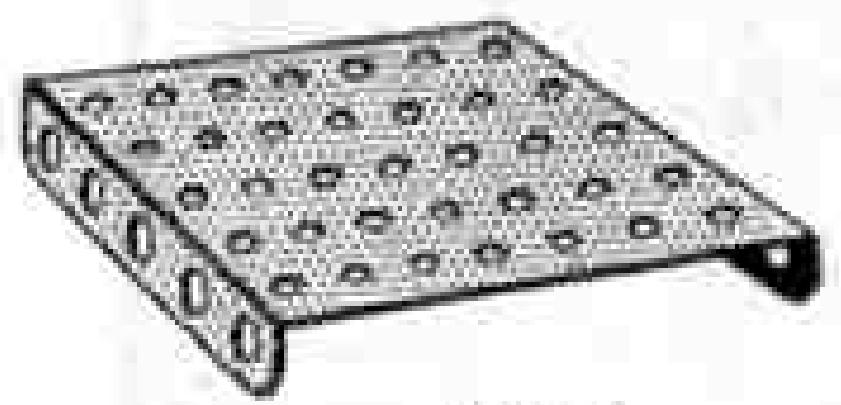
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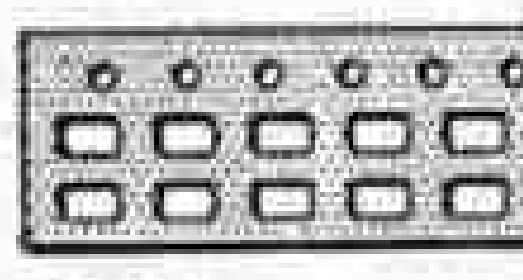
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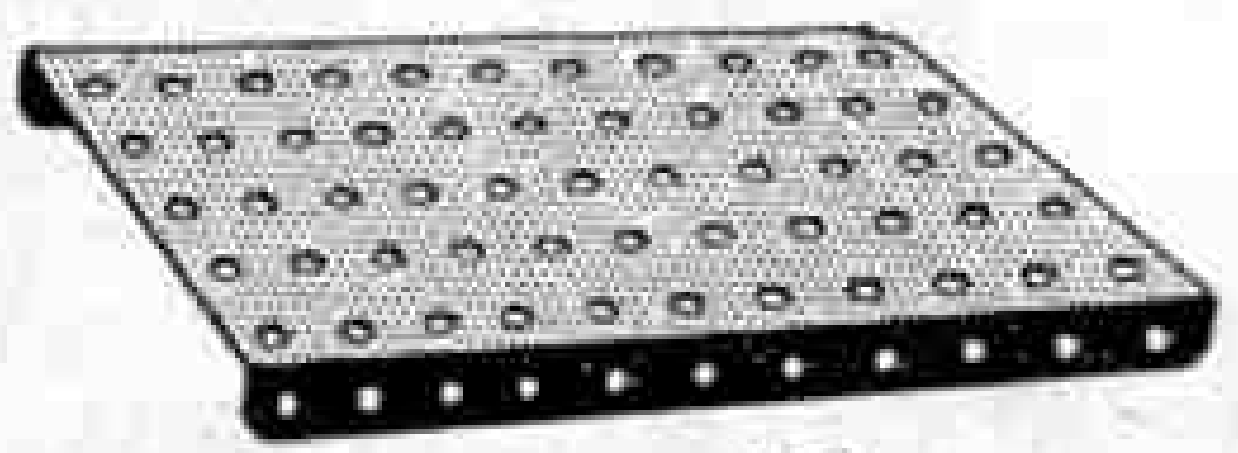
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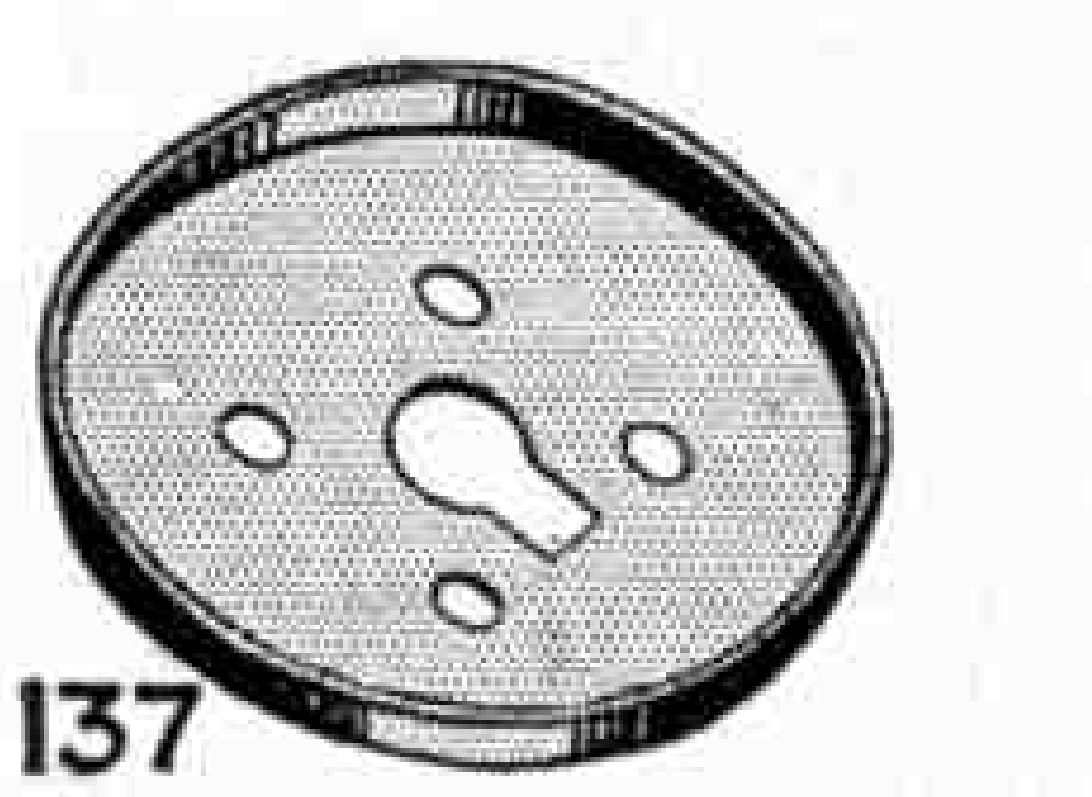
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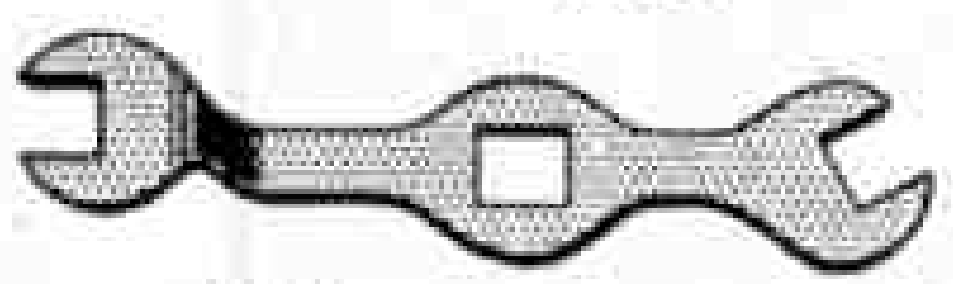
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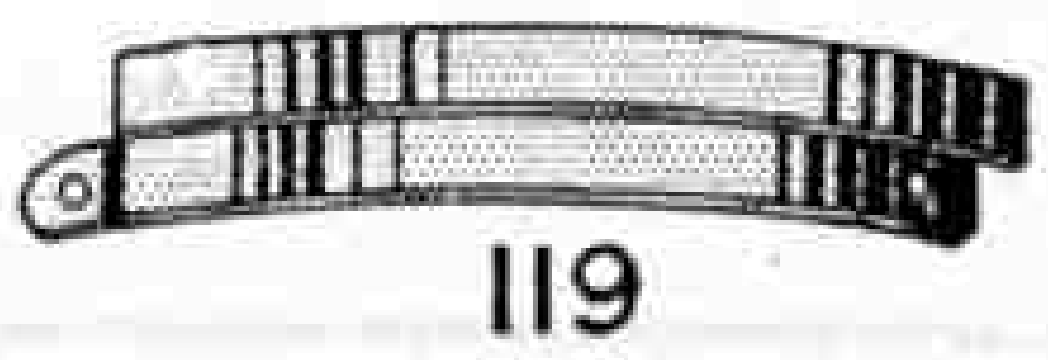
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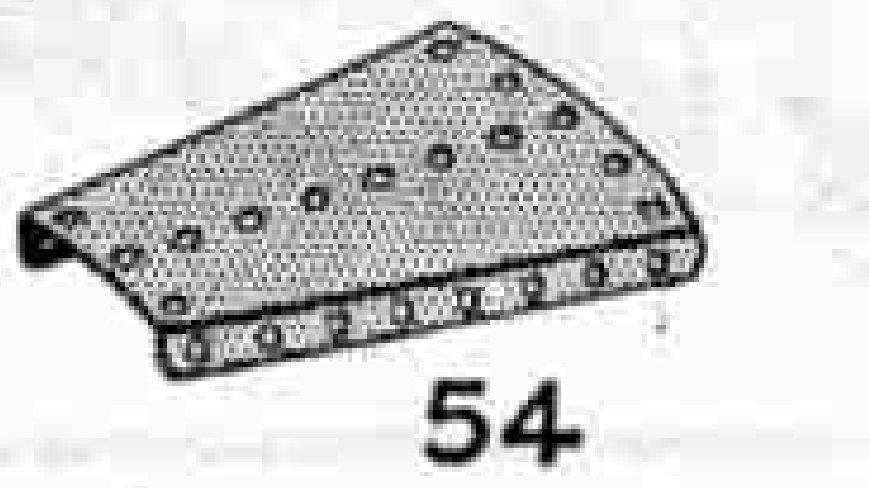
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Results of Meccano Competitions—*Continued*

"Jumbled Words" Contest (Home and Overseas)

The solution to the Jumbled Words which appeared on page 799 of the October, 1929 *"M.M."* is—

Nut, Pinions, Bevels, Bolt.

Only six competitors, including both the Home and Overseas Sections, submitted all-correct solutions, the vast majority of entries giving the plural of the words "Nut" and "Bolt" instead of the singular. Following the plan laid down in the competition announcement, the First Prize was awarded to the first correct solution examined and the remaining prizes were then allocated to the remaining correct entries, and then to the nearest correct first examined. The names of the competitors who secured prizes in the Home Section are as follows :—

First Prize (Meccano products to value 10/6) : A. A. Briggs, York. Twelve Prizes, each consisting of a copy of "Famous Trains" by C. J. Allen : M. Cocks, London, N.W.11 ; W. H. Mittins, Swindon, Wilts. ; A. H. Crook, Winchmore Hill, London, N.21 ; A. Scott, Hove ; S. Smith, Birmingham ; G. Thompson, Menthorpe Gate, near Selby ; S. H. Morrell, Chester ; D. Birss, Culter, Aberdeenshire ; Robert McWhirter, Kilmaurs, Ayrshire ; John Calder, Grangemouth, Stirlingshire ; K. A. Stott, Kersal, Manchester ; L. C. Heaton, Manchester.

In the Overseas Section the prizes were secured by the following boys :—

First Prize (Meccano products to value 10/6) : Jack A. Shanks, Sharbot Lake, Ontario, Canada. Twelve Prizes, consisting of "Famous Trains" by C. J. Allen : Tom C. Walker, Westmount, Canada ; Douglas Smithson, Boksburg, South Africa ; D. Dugmore, Cape Province, South Africa ; R. F. Dennison, Otago, New Zealand ; A. N. Kashyap, Lahore, India ; George Walker, Big Pats Ck., Victoria ; Albert G. Saunders, Hamilton, New Zealand ; R. Grey, Wanganui, East, North Island, New Zealand ; Arthur A. Sutton, Cremorne, N.S.W. ; Neville Gye, Windsor, Melbourne ; M. R. Paranjpe, Bombay, India ; Aubrey Shepherd, Bloemfontein, S. Africa.

"Parts Required" Contest (Home Section)

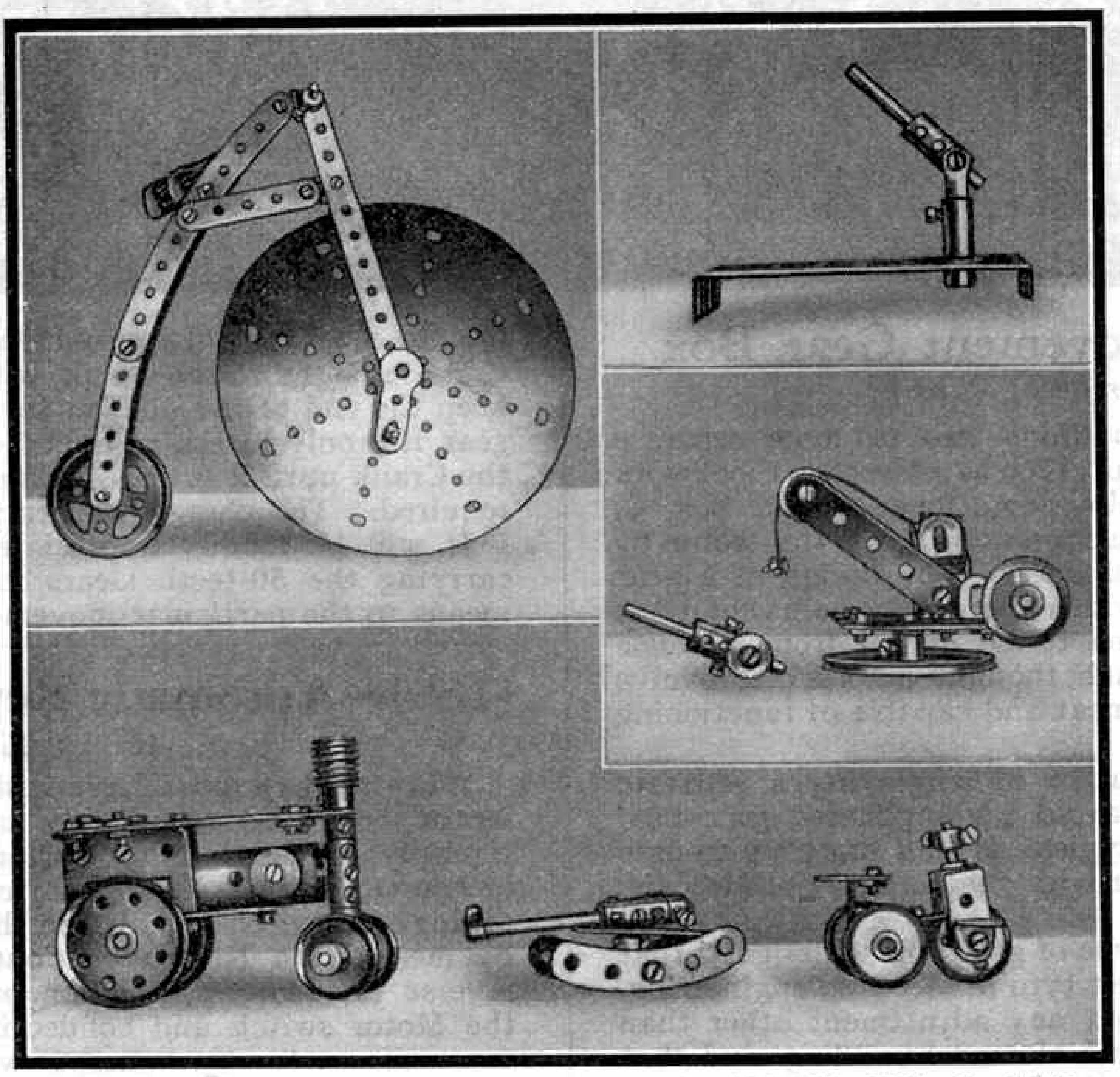
This Contest aroused considerable interest amongst Meccano enthusiasts, and examination of the entries received proves that the task of compiling a list of the parts used in constructing the Meccano model two-seater Motor Car that was illustrated on page 956 of the December, 1929 *"M.M.,"* was much more difficult than we ourselves had imagined.

No single competitor in the Home Section of the Contest succeeded in compiling an absolutely correct list of parts and accordingly the prizes were awarded to those competitors whose lists most nearly corresponded with the actual parts used in building the model. Under this system the following competitors secured prizes :—

First Prize (Meccano products to value £1-1s.) : D. Monk, Sittingbourne, Kent. Second Prize (Meccano products to value 15/6) : R. C. L. Howitt, Newark. Third Prize (Meccano products to value 10/6) : D. Herdman, Kingswinford, near Dudley.

Twelve Prizes, each consisting of a Meccano Engineer's Pocket Book : G. S. Marsh, Thornton, Blackpool ; H. O. Rodgers, Robin Hood's Bay, Yorks. ; Alister Lonnon, Kensington, W.8 ; H. G. Kidd, March, Cambs. ; R. Lamming, Mellor ; K. L. Howes, Reigate, Surrey ; W. E. Cocks, London, N.W.11 ; R. C. H. Shann, London, S.W.1 ; V. Kaile, Mayford, Surrey ; G. E. Perrett, Stockton-on-Tees ; R. Thompson, Louth, Lincs. ; John Kirkland, Hamilton, Lanarkshire.

The results in the Overseas Section and the correct list of parts will be published as early as possible, and it now remains to be seen whether model-builders abroad will be more successful in making an all-correct list of the parts required. The majority of competitors in the Home Section overlooked the fact that modern cars generally carry a spare wheel ! In the Meccano model two-seater this is fitted at the rear of the tonneau, and the edge of its tyre may just be seen projecting over the rear wing in the illustration.



A selection of models from the "Simplicity" Contest organised by Wolverley (Kidderminster) Meccano Club.

Wolverley M.C. "Simplicity" Contest

There is no question as to the good effect of Meccano model-building competitions in which boys can take part under well regulated conditions. The boys are encouraged to invent new models according to their own ideas, and in the work of invention their best qualities—initiative, concentration, patience and perseverance—are brought fully into play. Many Meccano Clubs, therefore, make a special feature of organised competitions amongst the members. As a rule the names of the prize-winners are announced in a local paper and frequently a local Meccano dealer takes the opportunity to exhibit the winning models in his shop window, for such displays always attract considerable attention.

One of the recent Club competitions to come before our notice is the "Simplicity" Contest organised by the Wolverley (Kidderminster) M.C. The illustration on this page shows a selection of prize-winning models constructed by the members, and it will be seen that ingenuity is not lacking among these enthusiastic Meccanoites.

The model of an old-fashioned "penny-farthing" bicycle, an excellent example of what can be done with a few parts, was entered by G. H. Eames. The other models are : Top right : anti-aircraft gun by P. L. Poole, who also constructed the small field gun that is shown in the middle right of the illustration alongside a realistic working crane built by M. T. Hancock. The models in the bottom row represent a steam tractor, a racing seaplane, and a tricycle and were built by R. S. Gadsly, O. T. Segrave, and R. Goodwin respectively. The members of Wolverley M.C. are to be congratulated on their enterprise and dexterity in model construction.

Meccano Competition Closing Dates

Home Sections

"Third Simplicity" ...	31st May
"Second Parts Required"	30th April
"April"	31st May
"Lister Truck" ...	30th April

Overseas Sections

"Christmas"	30th April
"Second Simplicity" ...	30th April
"Third Mechanism" ...	30th April
"New Year"	30th April
"Meccanitian" ...	30th April
"February"	31st May
"Second Parts Required"	30th June
"Third Simplicity" ...	31st July
"April"	30th August
"Lister Truck" ...	31st July

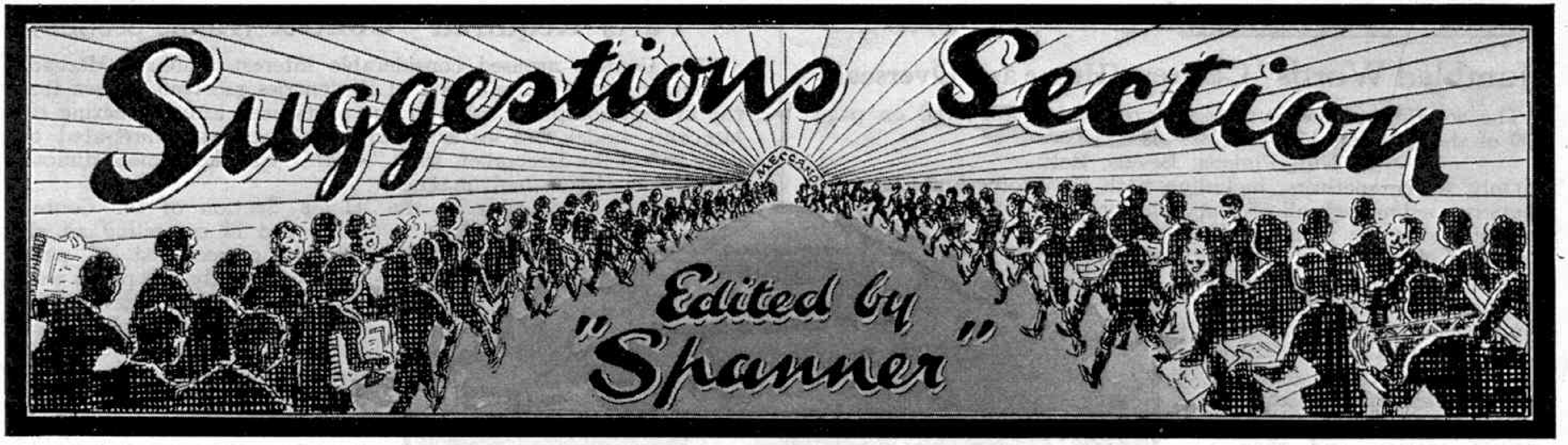
Two Interesting Local Contests

A successful Meccano model-building competition was held recently by F. J. Wain & Son, Kingsland Road, London, E.8.—a well known depot for Meccano and Hornby Trains. Many interesting and well-built models were submitted by local boys, and prizes were awarded as follows : First Prize, consisting of a Meccano Steam Engine : A. F. Field, Moray Road, N.4. Second Prize, consisting of a Meccano Clockwork Motor : W. Hill. Three Prizes of 5/- each : W. C. Clark, J. Brandon, and W. E. Hart. A number of consolation prizes also were awarded.

The headmaster of the Kingston Road Schools, Staines, and two of his colleagues recently were called upon to undertake the difficult task of judging the entries in a Meccano model-building Contest organised by the London Cycle & Sports Co., Staines. There were many models to judge and their task was not an easy one, for the competition had aroused great interest in the locality and the competitors had displayed considerable ingenuity in choosing their subjects and in constructing the models. The entries covered a wide field of engineering, and ranged from a replica of "R.100" to a dirt-track motor cycle and a steam excavator !

The prizes were ultimately awarded to the following competitors : First Prize (£1) : G. Lyon, Thames Street, Staines ; Second Prize (10/-) : Dennis Strachan, Staines Road, Laleham ; Third Prize (5/-) : George Wright, Stanwell Road, Staines. In addition various consolation prizes were awarded.

The First and Second Prize-winners submitted excellent models of a two-seater Morris sports car and a Lagonda saloon car, respectively, while the Third Prize was presented for an excellent model of a commercial lorry.



(188)—Novel Four-Movement Gear Box

(*G. Robinson, Horsforth, Leeds*)

THE more usual method of obtaining two or more separate movements from one power unit, such as a Meccano Clockwork or Electric Motor, is to employ some form of gear box, so that the desired movement may be connected up to the Motor by sliding certain gears into or out of mesh. The design of a gear box for a crane, for example, in which there may be as many as four or even five separate motions to be driven from a single motor, is a task that requires much thought in order to evolve a piece of mechanism that is both neat and capable of functioning in a reliable manner.

There is, of course, the alternative of employing a separate motor for each motion, so as to avoid a complicated gear box, but this arrangement, although typical of the most up-to-date practice, is not likely to find favour with the majority of Meccano boys on the ground of expense!

What is wanted, therefore, is a type of gear box so designed that it may be put together by the merest tyro in Meccano engineering, that will function efficiently without any adjustment other than that met with in the ordinary course of model-building, and that uses as few parts as possible. G. Robinson's device fulfils these conditions in a remarkably ingenious manner.

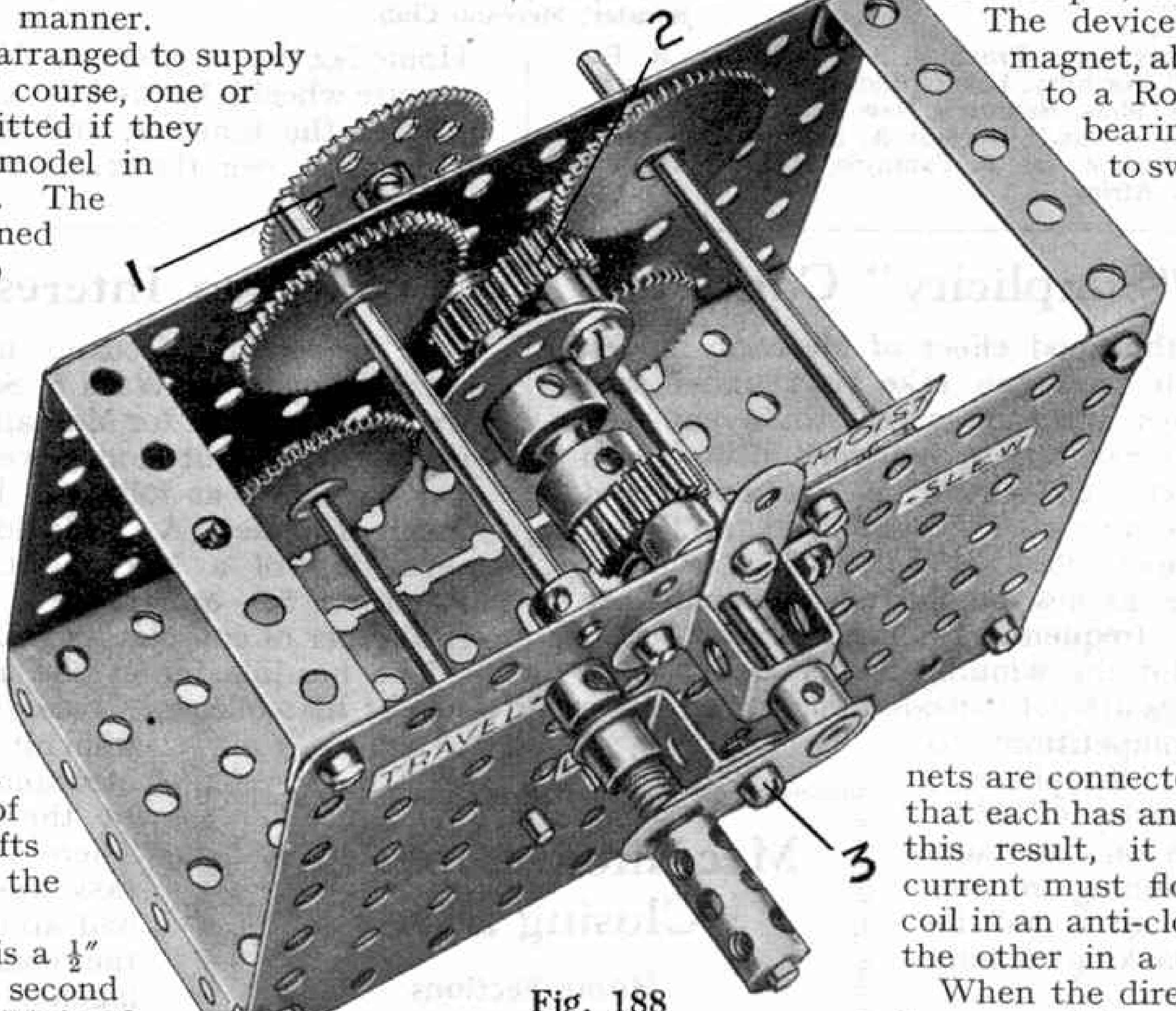


Fig. 188

As shown in Fig. 188 the gear box is arranged to supply four separate movements, although of course, one or more of these movements may be omitted if they are not required in the particular model in which the gear box is incorporated. The principle on which the gear box is designed is as follows: A pinion is arranged so that on operation of the "selector" lever it may be moved bodily round another pinion secured to the driving shaft, in the same way as the "planet wheel" travels round the "sun wheel" in epicyclic mechanism (see Standard Mechanism No. 268). The four separate shafts that are to be driven are arranged radially about the driving shaft, and carry gear wheels which mesh with the planet wheel when the latter is brought into direct line with a particular gear wheel and the sun wheel. Thus the planet wheel forms a connecting link by means of which any one of the four driven shafts can be linked up as desired with the driving shaft.

The sun wheel on the driving shaft is a ½″ Pinion that is in constant mesh with a second ½″ Pinion 2 forming the planet wheel. Pinion 2 is fixed to a Pivot Bolt that is carried in a Bush Wheel, and the latter is free to rotate independently of the driving shaft on which it is mounted. On turning the Bush Wheel the Pinion 2 may be brought into mesh at will with the 50-teeth Gears on the driven shafts.

The Bush Wheel is connected by a Socket Coupling to a ½″ Pinion that is loose on the driving shaft and is engaged with a similar Pinion that is secured on the end of a short Rod carrying at its outer extremity a Crank 3. As will be seen the Rod is journalled in a reinforced bearing comprising a Double Bent Strip bolted to the 5½″×3½″ Flat Plate that forms the side of the gear box. The end of the Crank is provided with a spring loaded plunger that may be inserted, on rotation of the Crank, in certain holes in the Plate. These holes are plainly marked in the illustration with the desired gear positions. The plunger is a short Rod free to slide in a Reversed Angle Bracket and a Flat Bracket that are bolted to the Crank, whilst a Compression Spring serves to keep the end of the plunger in the holes in the Plate. To change gear, it is only necessary to pull out the plunger and partially rotate the Crank until it is opposite the hole labelled with the movement required. The plunger is then released.

It will be readily appreciated that the drive from the Rods carrying the 50-teeth Gears may be conveyed by any suitable means to the particular movement it is intended to operate.

(189)—Automatic Reverse for Electric Motor

(*E. Turpin, Brighton*)

Many readers must have wished often that the 6-volt Electric Motor could be completely controlled from a distance—particularly in the case of working models of locomotives. It is, of course, quite a simple matter to stop and start the Motor by means of a switch included in the circuit, and to regulate its speed by means of a Resistance Controller, but it is not so simple to reverse the Motor's direction of rotation, except by dismantling the Motor switch and connecting it to the controlling point by numerous wires. In the idea put forward by E. Turpin, this difficulty is overcome.

The device consists essentially of a bar magnet, about 3 ins. long, clamped firmly to a Rod that is journalled in suitable bearings, so that the magnet is free to swing in the manner of a see-saw. The Rod carries at one end a Crank which is arranged to engage with a Threaded Pin on the switch arm of the Motor.

Beneath each pole of the bar magnet is placed an electro magnet, the cores of which are built up from Strips, the latter being arranged so that there is a gap between their poles and the bar magnet. Each is wound with a fairly large number of turns of 20 S.W.G. insulated wire, and the magnets are connected together in such a manner that each has an opposite polarity. To obtain this result, it should be remembered, the current must flow through the turns of one coil in an anti-clockwise direction, and through the other in a clockwise direction.

When the direction of the operating current is reversed by means of a suitable reversing switch, the polarity of the electro-magnets is also reversed. This causes the bar magnet to swing over in the opposite direction, thus actuating the reversing switch of the Motor and altering the direction of rotation. Care should be taken to see that the switch arm works fairly freely whilst maintaining good contact, otherwise the apparatus will fail to function satisfactorily.

This Month's Awards

The contributors responsible for Suggestions Nos. 188, 190, and 191 will each receive half a guinea, while E. Turpin will be awarded 7/6 for No. 189. Each contributor mentioned in the "Miscellaneous Suggestions" column will be presented with a Meccano Certificate of Merit and, in addition, S. Judson will be paid 5/–, R. Jacobi 2/6, and the senders of M.82 and M.85 will each receive a copy of the latest edition of the Meccano Standard Mechanisms Manual.

(190)—Overload Release for Electric Motors

(*P. Rogers, Crookesmoor, Sheffield*)

In actual practice every electrical circuit is equipped with safety devices designed to protect the apparatus from damage that might arise from the passing of a heavier current than that for which the circuit is designed. In ordinary house circuits fuses act as protective devices, but in the case of electric motors it is necessary to have additional protection in the shape of what is known as an "over-load release." This consists essentially of a solenoid that opens a pair of contacts in the event of the load on the motor—and consequently the current—becoming too great.

Fig. 190 shows a Meccano overload release mechanism. It is remarkably simple and will take but little time and few parts to build. When complete it may be put to actual use in protecting the Accumulator or Transformer from accidental shorts and the Motor from heavy overload currents. As will be seen from the illustration, a solenoid (consisting of two layers of Meccano 23 SCC wire wound on a Bobbin) is clamped in position on the base plate of the apparatus. A short Rod 1 slides freely in the bore of the solenoid and is connected pivotally to a switch arm carrying the contact 2. The latter is part of a Spring Buffer (part No. 120a) and it normally makes contact with a 6 B.A. Bolt that is insulated from the Plate by insulating Bushes and Washers and carries on its shank a terminal 3. One end of the winding of the solenoid is attached to the insulated terminal 4 whilst the other end is connected to the base plate.

To connect the device in circuit with a 6-volt Motor and Accumulator either of the two wires attached to the Accumulator should be connected to one of the terminals of the overload release, and the remaining terminal of the latter to the Motor. Hence the current is caused to flow through the turns of the solenoid and through the contacts of the overload release on its way to the Motor, and when the current rises above a certain value, the plunger 1 is drawn into the interior of the solenoid, thus moving the switch arm and breaking the circuit.

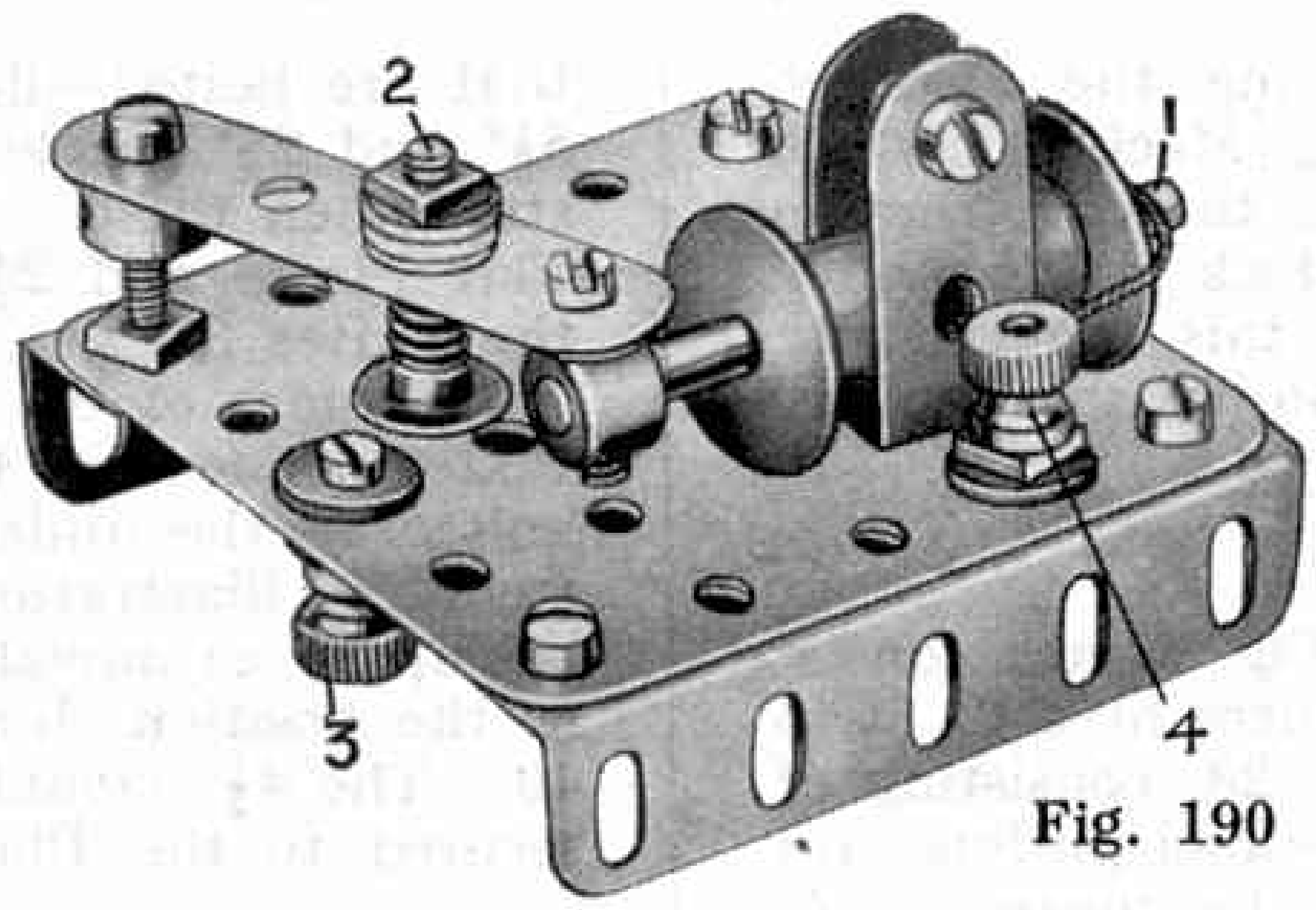


Fig. 190

(191)—Governing Device for Steam Engine

(*G. V. Redfern, Two Dales, Matlock, Derby*)

Most devices that are fitted to steam engines to keep the speed constant under widely varying loads, usually take the form of a centrifugal governor connected to a throttle valve in the steam pipe in such a manner that when the governor functions—due to a variation in engine speed—its movement is transmitted to the valve, so regulating the steam supply and hence the speed of the engine. With the form of governor shown in Fig. 191, however, both the governor and the manner in which it controls the engine are different from usual practice.

The device consists essentially of a weighted arm 5, which is mounted "off centre" so that it is sensitive to changes in speed of the flywheel. It is connected by a 1½" Strip to a second pivoted Strip 3, which is attached to the slide valve rod 2 at the point 4. As the end of the weighted lever flies outward (due to an increase of centrifugal force when the speed is increased), the lever 3 is moved nearer the centre of the wheel and so the radius of eccentricity of the point 4 is decreased. This means that the travel of the slide valve shortens and therefore the point in the stroke of the piston at which the admission of steam is cut off occurs earlier. The reverse happens when the speed drops.

The curved Strip 5 is pivoted to a ⅜" Bolt and spaced from the Hub Disc by Washers so that the heads of the retaining bolts of the Threaded Bosses forming the weights do not foul the Hub Disc. The Strip is prevented from flying out too freely by a length of Spring Cord 6, one end of which is secured to the Hub Disc and the other end to one of the bolts holding the Threaded Bosses. The Spring Cord is passed halfway round the pivot of the Strip 5 before being fixed in place. The Strip 3 is bolted to a Crank that is free to turn on a Pivot Bolt secured to the Hub Disc. The model may be set in motion by turning the handle 1.

The advantage of this form of governor over the more common type, is that the steam is made to work in the most economical manner, for when the speed of the engine increases the cut-off takes place earlier in the piston stroke, and the piston completes its journey by the aid of the expansion of the steam. Hence as much as possible of the energy of the steam is extracted. With the other method the live steam—which is at reduced pressure due to the throttling effect at the valve—follows the piston for the greater part of its stroke, with the result that the expansion of the steam is not utilised.

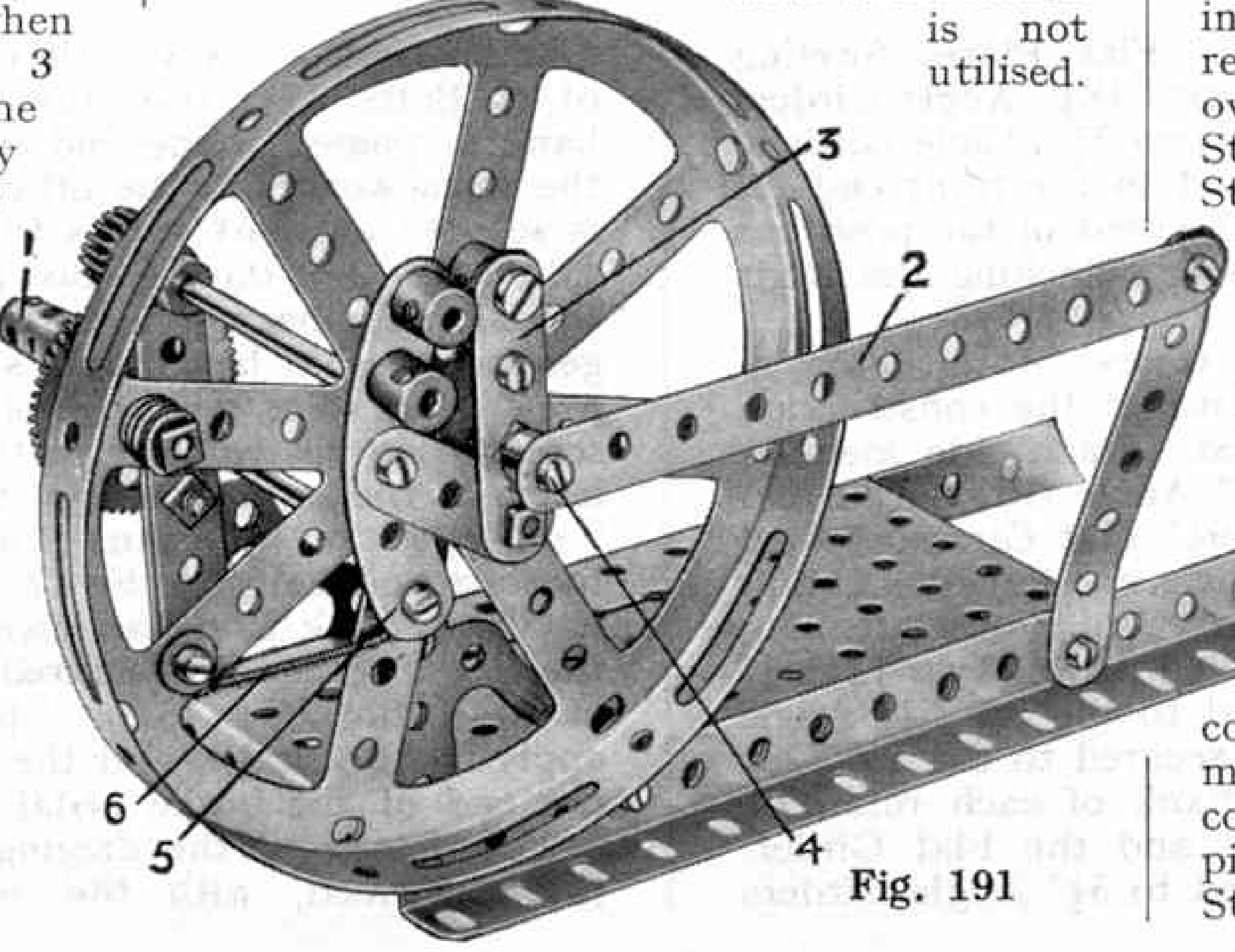


Fig. 191

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.82). Meccano Wind Gauge.—Many "*M.M.*" readers will be interested to have details of an apparatus by R. Cail (Normanby, Yorks.) by which the strength of the wind may be determined. The device consists essentially of a four bladed propeller secured to a Rod that is journalled in suitable bearings. A length of elastic is attached to the Rod and to the frame of the model, so that when the Rod is turned by the wind acting on the blades of the propeller, the elastic is wound on to it thereby introducing an increasing retarding effect. The movement of the shaft is indicated by a pointer.

(M.83). A New Game.—S. Judson (London) gives details of a new game that is sure to prove popular with many of our readers. An outline map of England (or any other country) is neatly drawn out on a sheet of cardboard and holes are made in positions corresponding to the chief towns, nuts and bolts being inserted in each hole. A list of the same towns is written out down one side of the map and nuts and bolts are fixed opposite each name. Each town on the map is then connected by wire to the corresponding town on the list. A Lamp, mounted in a Lamp Holder, is attached to a Flat Girder, which also carries two insulated terminals. One wire from the Accumulator is attached to the Flat Girder and the other wire to one of the terminals, whilst the insulated 6 B.A. Bolt retaining the Lamp Holder is connected to the remaining terminal. A length of wire is attached to each of the terminals, and is fitted with a Threaded Pin. One of the two players places his Threaded Pin on the name of a town, whilst the other endeavours to find with the second Threaded Pin the correct position on the map. When this has been found, the lamp lights.

(M.84). Three-aspect Colour Signal.—Those readers who are owners of Hornby railways will be interested in the three-aspect colour signal proposed by R. Jacobi (London, S.W.20). It consists essentially of a 6-volt Lamp mounted in a Lamp Holder that is secured in a box-like frame on the upper extremity of a Strip forming the signal post. Its position is such that its light may be viewed through one of the holes of a Strip. A short Strip is attached to two Eye Pieces so that it may slide up and down the post in front of the light and small pieces of red, yellow and green paper are stuck over three consecutive holes in this sliding Strip. By moving the covered holes of the Strip (which may be actuated from a lever frame) in front of the lamp the required light is shown to the approaching train.

(M.85). Meccano Nut Crackers.—While a pair of nut crackers scarcely forms a suitable subject for a Meccano model, yet it cannot be denied that the strongly designed pair by B. Warner (Grahamstown, S. Africa) has practical uses that many of our readers will appreciate! The crackers consist essentially of two channel-section members built up from Angle Girders and connected pivotally at one end. The gripping surfaces proper are composed of Rack Strips bolted to the Angle Girders.

Meccano Giant Dragline

Final Instructions for Building this Splendid Model

THE first instalment of this article describing the Meccano model of a 300-ton Dragline Excavating Machine, which appeared in last month's issue, dealt with the construction of the jib, travelling base, bucket, and pulley block of the model. Continuing the constructional details, we deal this month with the superstructure framework and gear box, and with the final assembly and operation of the Dragline.

The A-Frames and Superstructure

The A-frames or vertical members shown in Fig. 5 each consist of four 7½″ Angle Girders spaced apart in the centre by a 2″ Strip and at each end by a 1½″ Strip. Two "ties" 23, consisting of 18½″ Angle Girders bolted together to form channel girders, are connected to the top of each vertical member by means of 2″ Rods that are passed through the vertical members. The 1″ loose Pulleys 24 are mounted on 2½″ Rods that are carried by 1″ Triangular Plates attached to the 7½″ Angle Girders, and a further 1″ Pulley 25 is carried on a 3″ Rod inserted in the third hole from the top of each member.

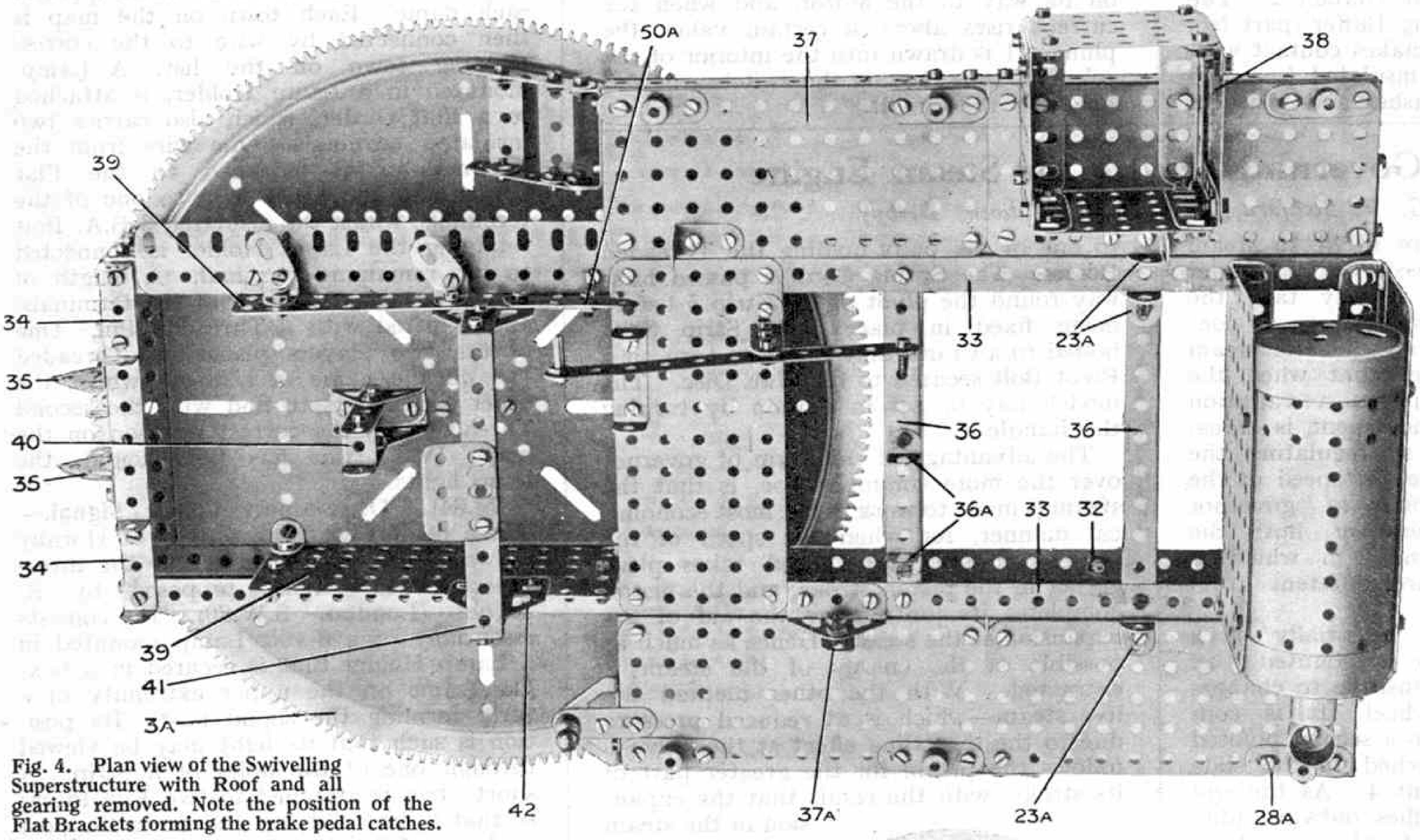


Fig. 4. Plan view of the Swivelling Superstructure with Roof and all gearing removed. Note the position of the Flat Brackets forming the brake pedal catches.

The framework to which the 5½″ × 3½″ Flat Plates forming the roof proper are attached, consists of two 18½″ Angle Girders 26 connected together at the rear end by two 7½″ Angle Girders, while two 2″ Angle Girders 27 are attached to the front ends of the Girders 26. Double Arm Cranks are secured in the positions indicated to provide the necessary means of attaching the Rods 28 that support the roof.

Fig. 7 shows the complete unit with Gears, Motor, etc., in place, whilst Fig. 4 gives a very good idea of the construction of the framework, with all gears removed. Each side member of the frame consists of two parallel 18½″ Angle Girders 32 and 33 (Figs. 4 and 7) spaced apart by two 9½″ Flat Girders bolted end to end. The front end of the members are joined together by two 5½″ Angle Girders and a 5½″ Flat Girder and are connected to the sides by means of 1½″ Angle Girders. Two 1½″ × ½″ Double Angle Strips 34 (Fig. 7) are bolted to the top 5½″ Angle Girder and two Trunnions 35 (Fig. 4) are secured to the 5½″ Flat Girder, a Washer being placed on the shank of each retaining bolt between the flange of the Trunnion and the Flat Girder.

The 5½″ × 2½″ Flat Plates 37 are attached to 5½″ Angle Girders that are bolted—flanges outward—to the Angle Girders 33, and 5½″ and 2½″ Angle Girders are attached to their outer edges to strengthen them. The coal bunker 38 is built up from 2½″ × 2½″ Flat Plates and 2½″ Angle Girders, and secured in position on the Plates 37.

The sides of the gear box proper consist of two 5½″ × 2½″ Flat Plates 39, secured to the Angle Girders 33 by 5½″ Angle Girders bolted to the underside of the former Girders. As will be seen from the illustration (Fig. 4) the entire structure is mounted on the upper, or movable, Geared Roller Race 3a, to which are bolted in the position shown, two Trunnions that carry the 2½″ Strips 40. The 4½″ Double Angle Strip 41 is bolted between 1½″ Strips secured to the Plates 39 by Flat Trunnions 42.

Details of the Gear Box

Fig. 7 is a plan view of the Swivelling Superstructure of the model with all the Gears, Motor, brakes, etc., in position.

The Motor is bolted to the Girders 36, its front end being attached to the Angle Brackets 36a (Fig. 4). A 2″ Rod, journalled in the side plate of the Motor, carries a 57-teeth Gear Wheel in mesh with a ½″ Pinion on the armature spindle, and also a ½″ Pinion that engages with another 57-teeth Gear on the 4½″ Rod 43a. This Rod also carries a Sprocket 43 and a Worm 64, and is journalled in the Motor side plates and in an additional bearing 37a (Fig. 4) consisting of a 1½″ Strip bolted to a Trunnion that is secured to the Angle Girder 33.

The hoisting winch consists of a 3½″ Gear 44 secured on a 2½″ Rod that is journalled in one of the Plates 39 and in the centre bearing 40. One Bush Wheel, one Collar, and three Washers are secured in place on the 2½″ Rod to represent the "hoist barrel." A 3″ Pulley 45 secured to the 3½″ Gear by means of ⅜″ Bolts, comprises the brake drum round which the brake band is passed. One end of the latter is fixed to a portion of the framework and the other end is attached to a Coupling that is secured at right angles to a short Rod journalled in both the side plate 39 of the gear box and in the 9½″ Flat Girder comprising the side member. The outer end of the Rod carries a Crank (see general view in last month's "*M.M.*") in the end holes of which a 1½″ Rod 46 is mounted pivotally by means of a Collar, a set-screw being passed through the end hole of the Crank and screwed home in the tapped hole of the Collar. The brake is kept in the "off" position by means of a short length of Spring Cord fastened by nuts and bolts to the Crank and to the 7½″ Flat Girder above it; the Crank is spaced away from the side by two Washers on the Rod. When it is desired to hold the brake on for any length of time, the Rod 46 or "brake pedal" is pushed down, thus applying the brake, and the pivoted Flat Bracket is swung over the end of the brake pedal to hold it down.

The details of the digging winch are exactly similar to that just described, with the exception that the brake-actuating cranks are secured on a 6½" Rod 47 that passes completely across the gear box and is journalled in the side frames.

The luffing winch consists of a 5" Rod 49 to which is secured a 50-teeth Gear Wheel 49a, and a Ratchet Wheel. The Pawl 50 is mounted on a Pivot Bolt attached to the Strip 50a (Fig. 4). The Pawl carries a Threaded Pin in its tapped hole, by which it can be disengaged from the Ratchet.

Slewing and Travelling Motions

A Socket Coupling 58 carries at its upper end the male portion of a Dog Clutch and at its lower extremity a ½" Double Width Pinion that is in constant engagement with the Worm on the Rod 48. The Socket Coupling is placed on the Rod 8 and should be perfectly free to revolve on it and only turn the Rod when pushed up into engagement with the female portion of the Dog Clutch that is secured rigidly to the Rod.

The lever 59 controls the travelling movement, and consists of a 3" Strip that is attached by means of a Crank to a short Rod journalled in a 1½" Double Angle Strip, which is bolted to the floor plates.

The special Pinion (Part No. 167c) engaging with the teeth of the lower fixed Race 3, is secured to a 4½" vertical Rod 60 journalled in the 5½" Angle Girder 36 and also in a second 5½" Girder and Double Arm Crank that is bolted to the lower 18½" Angle Girders 32 (Fig. 4). One portion of a Dog Clutch and a 57-teeth Gear Wheel are connected together by means of a Socket Coupling 61, the complete unit being shown in Fig. 7 removed from its Rod for the sake of clearness. Actually, of course, it is placed on the Rod 60 and operated by the lever 62, the ⅜" Bolt in the end of which engages with the groove of the Socket Coupling.

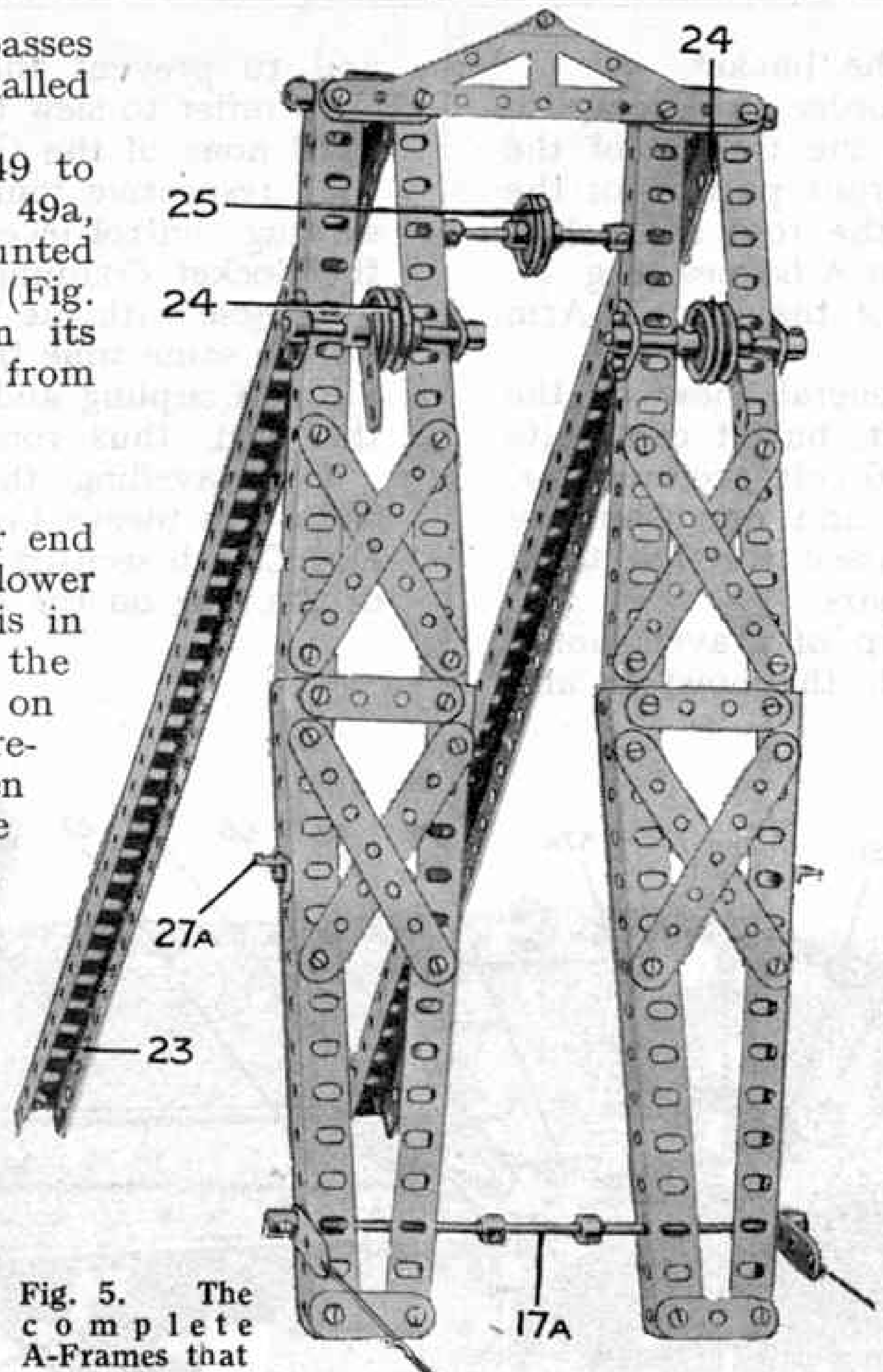


Fig. 5. The complete A-Frames that support the Jib.

A 1" Gear 52 is secured to a short Rod carrying also a 1" Sprocket Wheel that is connected by Sprocket Chain to the ¾" Sprocket 43 on the shaft 43a driven by the Motor. A Coupling is secured to the inner end of the short Rod in such a manner that the other end of the Coupling may be fitted on to the projecting end of the Rod 49 and be free to turn thereon. This arrangement forms a convenient support for the inner end of the short Rod, and its outer end is journalled in a bearing consisting of a Handrail Support, which is secured in the boss of a Threaded Crank that is bolted to a Trunnion and to a 5½" × 2½" Plate that forms part of the flooring or "operating platform" of the superstructure.

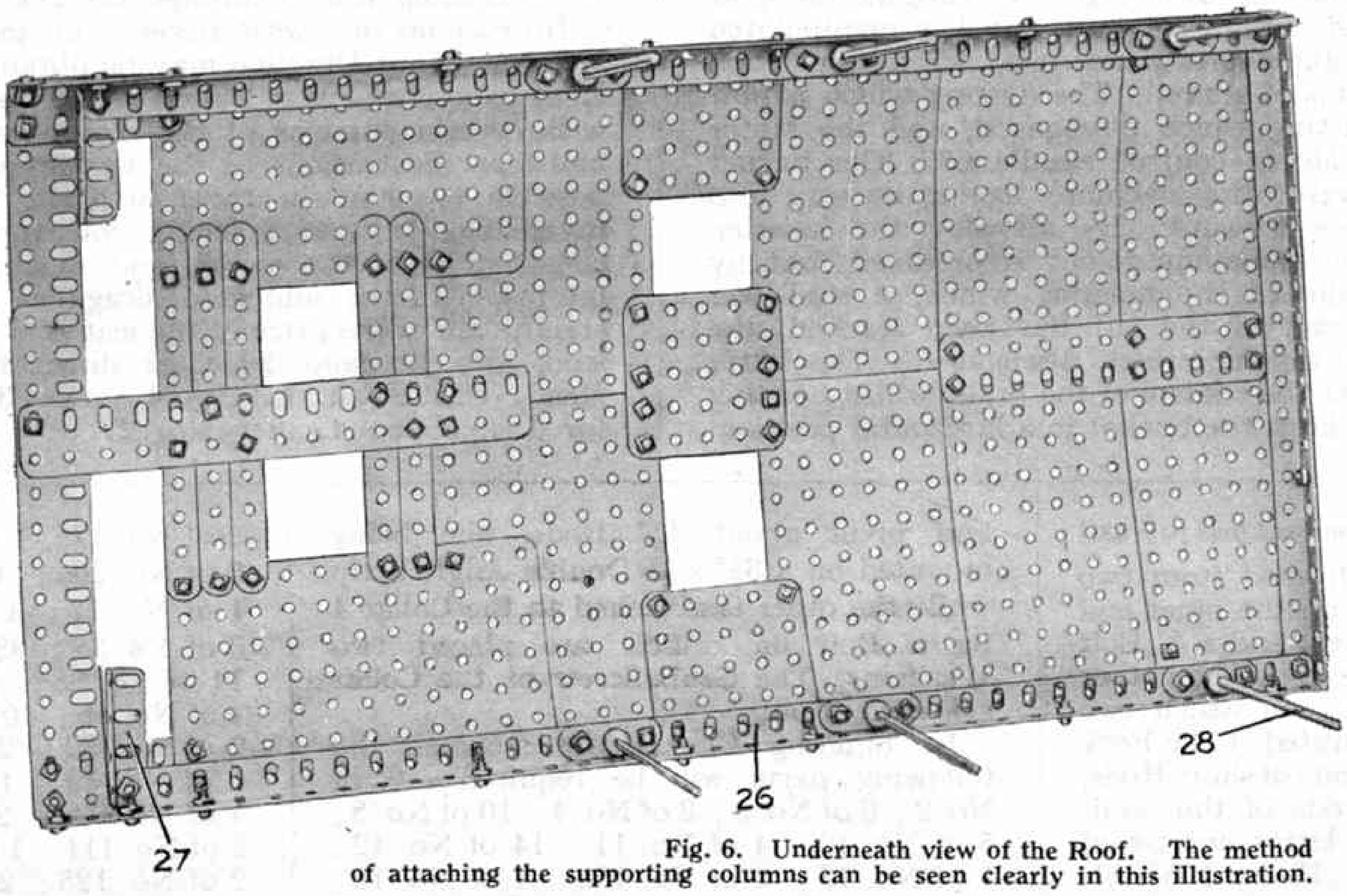


Fig. 6. Underneath view of the Roof. The method of attaching the supporting columns can be seen clearly in this illustration.

Adjusting the Gear Box

To adjust the gears in the gear box, the 6½" Rod 51 which forms the sliding primary shaft, should first be placed at the extremity of its travel to the left (looking toward the front of the model) and the 1" Gears 52 and 56 so arranged as to be just in mesh with each other. (A Collar on the other end of the Rod will be secured in place when all the other movements have been adjusted to prevent any further movement of the Rod to the left). In this position of the Rod the ½" Pinion 53 is in mesh with the 3½" Gear Wheel 44a of the digging winch, as will be seen from Fig. 7.

A slight movement of the Rod to the right (caused by turning the gear selector wheel 57) should result in the Pinion 55 being brought into engagement with the gear 44 of the hoisting winch, and the Pinion 53 out of engagement with the Gear 44a. By continuing the movement of the Rod to the right, the Gear 44 will eventually become disengaged, at which point the 50-teeth Gear 48a on the Rod 48 should be in mesh with the ¾" Pinion 54. At the extreme limit of the travel of the Rod to the right the ¾" Pinion 54 comes into mesh with the Gear Wheel 49a on the luffing winch barrel 49.

It will most probably be found that the Gears 48a, 49a both remain in mesh with the ¾" Pinion 54 in this extreme position of the Rod 51. This does not matter, however, so long as the Gear 48a comes into engagement with the ¾" Pinion before the Gear 49a. It is necessary of course that the gears 52 and 56 are in mesh throughout the complete travel of the Rod 51.

The sideways movement of the Rod 51 when changing gear is effected in the following manner: A Threaded Crank runs on the end of the 5" Threaded Rod 57a, which is journalled in the Trunnions 42 and restrained from sideways motion. The Rod 51 passes through the end hole of the Crank, which is retained in position on the Rod by Collars on both sides as shown. When the handwheel 57 secured to the Threaded Rod is rotated, the Threaded Crank advances or recedes along the Rod and so moves the Rod 51.

The Motor switch is operated from the central controlling position of the model by means of the Crank 63.

Final Assembly of the Model

The compensating beam 12 is placed in position by passing the Pin 16 through the Double Brackets 16a, which are bolted to the Girder 1 (see Figs. 2 and 3), and the Rods 15 through the end holes of the Strips 15a so that the Rods slide freely in them. The Strips 15a brace the beam and prevent it from twisting; they each consist of one 4½" Strip and a 2" Slotted Strip. The ¾" Sprockets mounted on the base are connected to the Sprockets on the bogies by suitable lengths of Sprocket Chain.

The swivelling superstructure is now lowered on to the Ring Frame, the Rod 8 passing through the Bush Wheel bolted to the upper Race. At this juncture the Socket Coupling 58 (Fig. 7) is slipped on to the Rod 8, the end of which is then passed through the Flat Girder attached to the Double Angle Strip 41 (Fig. 4). (The latter Strip has been broken away in Fig. 7 to show the gearing more clearly).

The A-frames (Fig. 5) are secured to the 1½" Double Angle Strips 34 (Fig. 7) and the rear ties attached to the Angle Brackets 23a. The 1" Triangular Plates at the jib foot are pivoted on the 6½" Rod 17a that is passed through holes in the Girders of the A-frames and held in place by Collars on the Rod; the 1½" Strips attached to the ends of the ropes that form the stays for the jib are placed also on the end of this Rod.

One end of the luffing rope is attached to a 1½" Strip on the Rod carrying the 1" Pulleys 24, and is taken round one of the Pulleys at the jib head and back over one of the Pulleys 24. Thence it passes round the last Pulley at the head of the jib and then over the remaining Pulley 24 to the luffing winch barrel 49 (Fig. 7), on which it is secured by a Collar.

The hoisting rope is secured to the ½" Reversed Angle Bracket on the Pulley Block from which the drag bucket is suspended, led over one of the topmost Pulleys at the jib head and rove through the sheave of the block; thence it passes over the other Pulley at the jib head and down to the hoisting winch barrel over the Pulley 25. The digging rope is secured to the digging winch barrel and is led over the 1½" Pulley 35a, the Hook on its end being attached to the Sprocket Chain bridle of the bucket.

Lastly the roof is placed in position. In order to accomplish this, it is necessary to remove temporarily the ties 23 of the A-frames and the Flat Girders forming the front portion of the roof. The 2″ Angle Girders 27 (Fig. 6) of the roof are bolted to the Angle Brackets 27a on the sides of the A-frames (Fig. 5), and the Rods 28 are secured in the bosses of the Double Arm Cranks 28a.

The accumulator carrier shown in the general view of the model is designed for a 4-volt 8 ampere unit, but it can quite easily be enlarged so as to accommodate a 6-volt accumulator. The chimney consists of five Sleeve Pieces and one Chimney Adaptor attached to a 6½″ Rod by bolts passed through them and inserted in the set-screw holes of Collars.

In order to set the model to work, a heap of gravel should be deposited in front of the machine. Both the hoisting and digging winches should first be disengaged by turning the gear selector wheel 57, and the brakes of both winches manipulated so that the bucket lowers and comes to rest in a horizontal position at the far edge of the heap of gravel. The digging winch is now engaged, leaving the hoisting winch disengaged, and the Motor started by moving the Motor control handle 63. The bucket will now be dragged towards the machine, digging its way into the material as it moves forward. By allowing the hoisting winch to run out freely a maximum cut is obtained, but by lightly applying the brake of the hoisting winch, a shallower cut results. When the end of the cut has been reached, the hoist is engaged and the digging winch disengaged. The latter is allowed to run out under the control of the brake whilst hoisting is in progress in order to keep the bucket in a horizontal position, and to prevent the contents of the bucket being spilt.

In order to slew the model the gear selector wheel 57 is turned until none of the Gears 44, 44a, or 49a are in engagement with their respective Pinions on the Rod 51; this is "neutral." The slewing control lever 62 is then pulled upward, thereby lowering the Socket Coupling 61 and bringing the Gear attached thereto into mesh with the Worm 64 on the shaft 43 driven by the Motor. At the same time the portions of the Dog Clutch attached to the Sleeve Coupling and the Rod 60 come into engagement and turn the Rod, thus rotating the superstructure.

For travelling, the control lever 59 is moved backward. This slides the Sleeve Coupling 58 upward so that the portion of the Dog Clutch secured in its upper end engages with the other portion of the Dog on the Rod 8. The latter is thus rotated and drives the travelling wheels through the gearing shown in Fig. 3.

Instructions in Leaflet Form—Full instructions for building the Meccano Giant Dragline may be obtained in the form of a special eight-page instruction leaflet. This leaflet deals at greater length with certain portions of the model and also contains additional half-tone illustrations of the various units that it has not been possible to show in these articles. The leaflet will be found invaluable, both as a handy constructional guide for intending constructors of the model, and as a work of reference for those interested in the subject of draglines from a general engineering standpoint. The price of the leaflet is 3d. and it may be obtained from any Meccano dealer or direct from Meccano Ltd., Binns Road, Old Swan, Liverpool, price 3d. post free. Please ask for Instruction Leaflet No. 27.

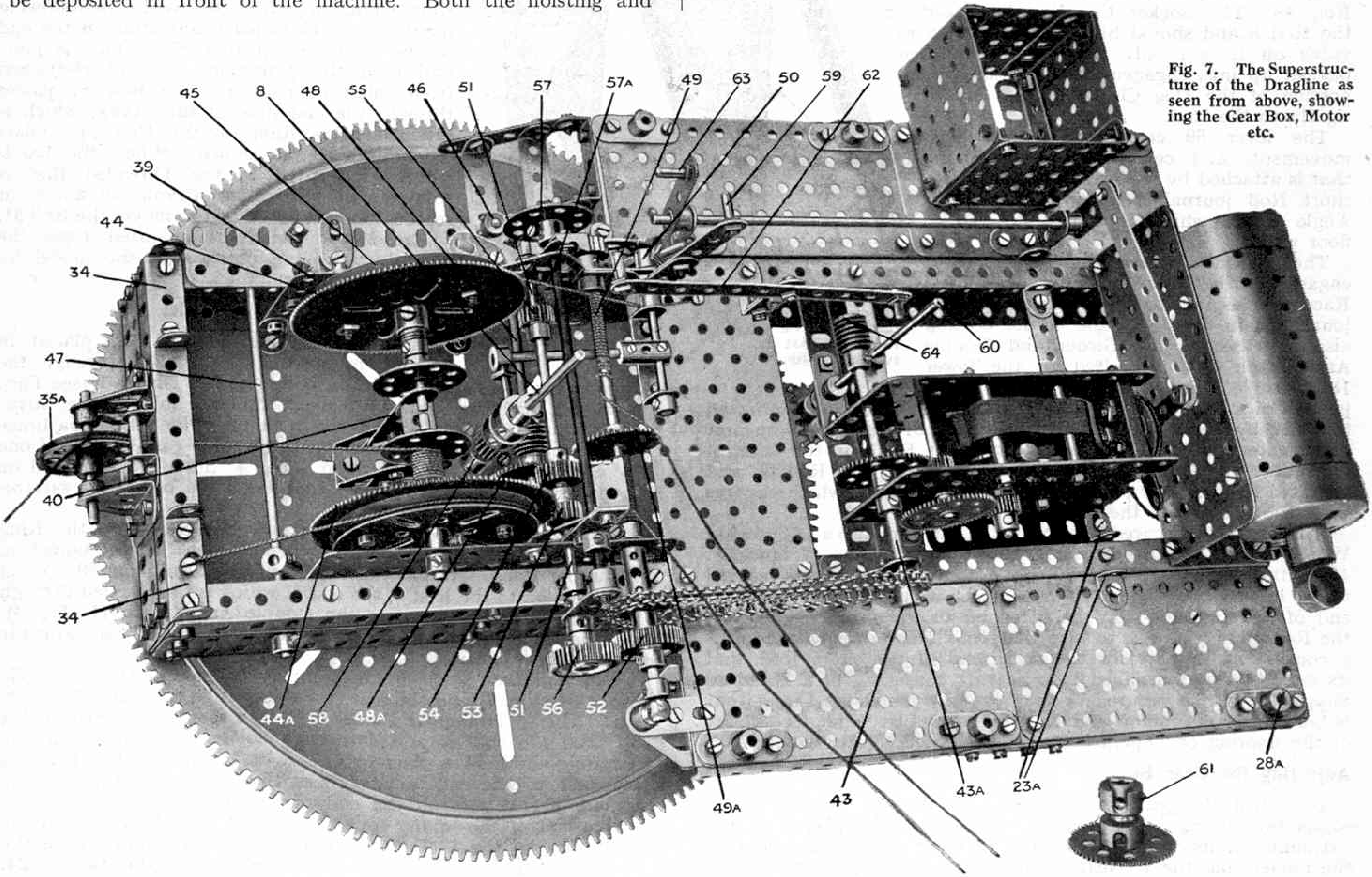
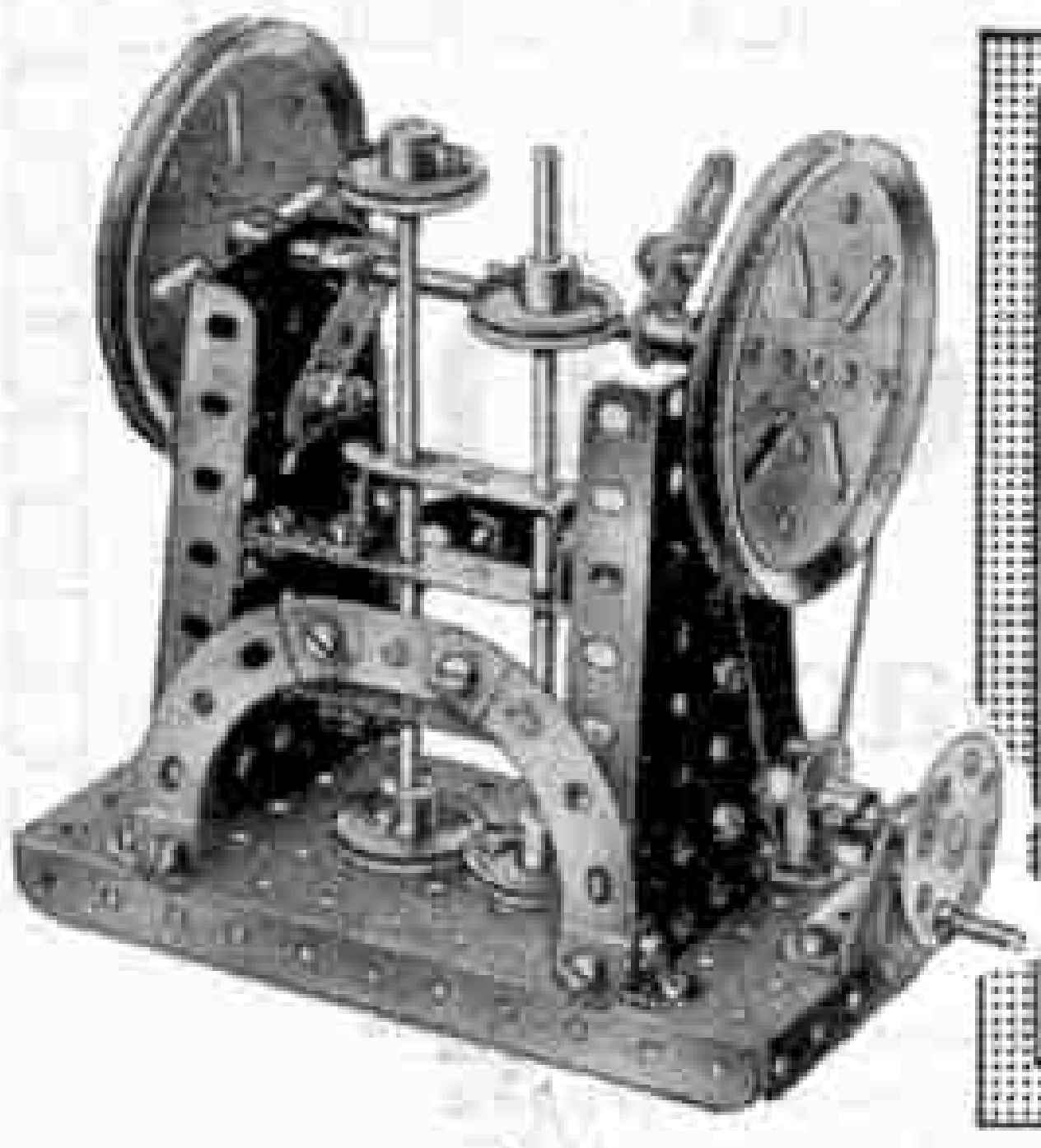


Fig. 7. The Superstructure of the Dragline as seen from above, showing the Gear Box, Motor etc.

New Meccano Models—*(Continued from page 299)*

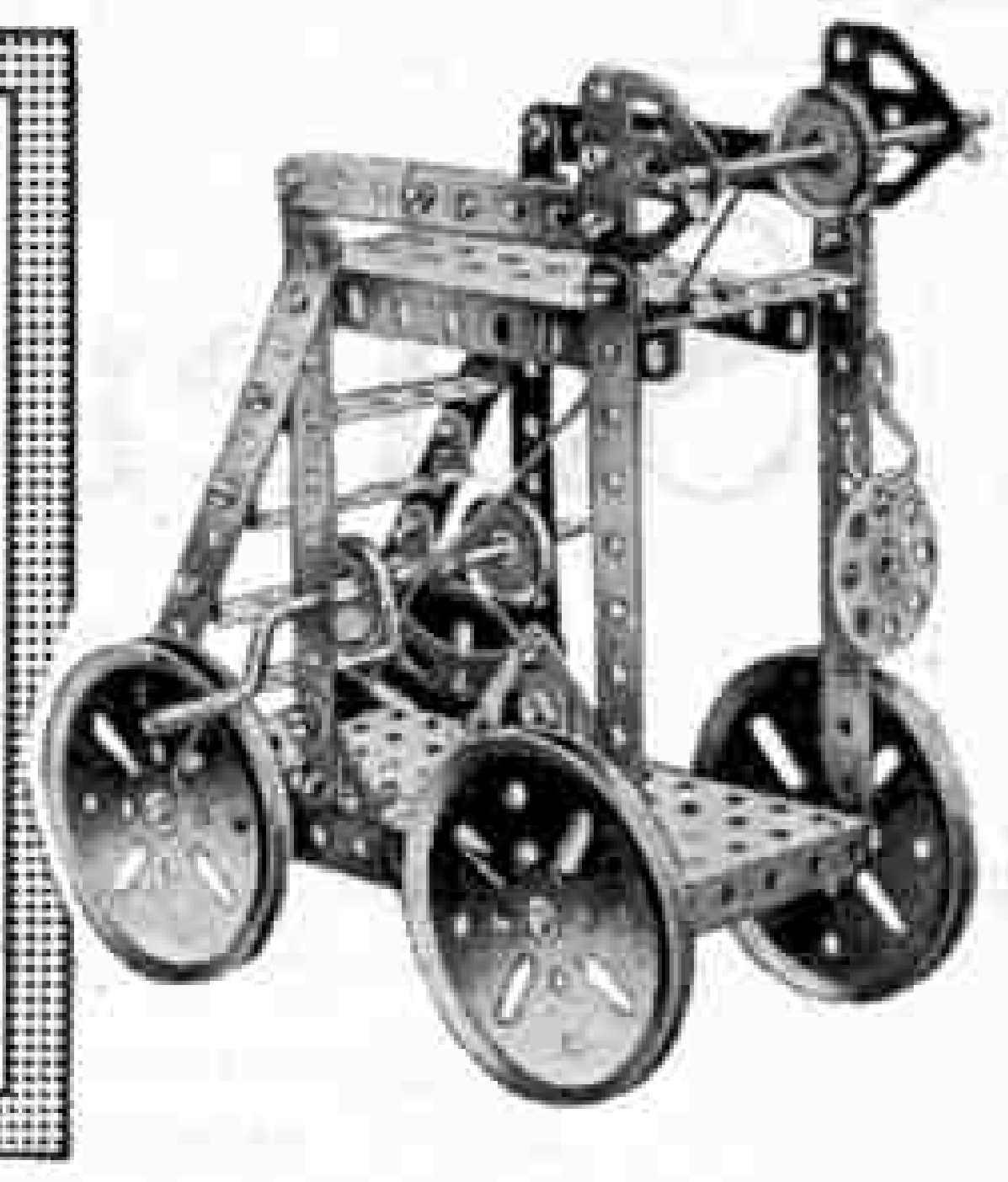
Each paddle wheel is formed from two 3″ Pulleys on a 3½″ Rod, on the inner end of which a 2″ Pulley is fixed, and a ¾″ Bolt 1 connects the 2″ Pulleys rigidly together and forms a "crank pin" on which two Small Fork Pieces are mounted. The Fork Pieces are secured to the ends of short Rods, representing the piston rods of the oscillating cylinders. The latter consist of Sleeve Pieces fitted with ¾″ Flanged Wheels and pivot about 4½″ Rods, one being mounted on a 3½″ × ½″ Double Angle Strip while the other is attached to the Collar 4 by a Bolt on which are placed two Washers. The Grub Screw of the Collar grips the Rod.

In building the paddle steamer the following parts will be required:—6 of No. 2; 6 of No. 3; 2 of No. 4; 10 of No. 5; 5 of No. 10; 4 of No. 11; 14 of No. 12; 1 of No. 13; 2 of No. 15a; 4 of No. 16; 2 of No. 17; 1 of No. 18a; 4 of No. 19b; 2 of No. 20a; 4 of No. 20b; 1 of No. 21; 1 of No. 22; 1 of No. 22a; 1 of No. 24; 6 of No. 35; 93 of No. 37; 4 of No. 37a; 14 of No. 38; 1 of No. 40; 1 of No. 45; 1 of No. 46; 10 of No. 48a; 1 of No. 48b; 2 of No. 52; 2 of No. 53; 1 of No. 54; 4 of No. 59; 1 of No. 62; 1 of No. 63; 4 of No. 90a; 2 of No. 99; 2 of No. 100; 2 of No. 111; 1 of No. 115; 1 of No. 116a; 2 of No. 125; 2 of No. 163; 1 of No. 165.



MECCANO

Model Building Contest



For the best original Models made with Meccano

HAVE you won a prize in a Meccano Contest? If you have, why not win another? If you have not, there is all the more reason why you should enter the new Meccano model-building Competition announced below, for there is nothing to prevent you winning one of the many prizes offered if you set to work right away and build a new and original model.

Every competitor has an equal chance in this competition, no matter what Outfit he may possess. All you have to do is think of a new model, no matter how simple, and construct it as neatly as possible. Boys and girls of any age may compete and a competitor may submit more than one model for consideration. No special entry forms are needed and there are no fees to be paid.

You may use any number of parts in constructing the model you wish to enter, but it is a mistake to think that the more complicated a model is, the better the chance you will have of winning a prize. Very often indeed the reverse is the case and a simple model that is well proportioned and displays sound constructional features secures a prize in preference to a model in the construction of which the chief aim has been to produce an intricate piece of mechanism without any regard either to proportion or correct principles. That is the reason why so many apparently simple models have appeared among the successful entries in recent contests.

In entering this contest you should try to be as original as possible in your choice of a subject, for in making the awards the judges will pay special attention to models showing initiative and which are not simply variations of models included in the Meccano Manual of Instructions.

Rules Governing Entry

There are thousands of interesting subjects for you to choose from.

If you cannot think of a really original model, however, try to incorporate in your car, aeroplane, loco or other model a new use for a Meccano part or a little detail work so that the finished model is as realistic as possible.

All models submitted must, of course, be new; we do not want to find amongst the entries some old friends from the early Meccano Instruction Manuals!

Entries will be divided into three Sections as follows: Section A for readers residing in the British Isles and over 14 years of age. Section B for readers residing in the British Isles and under 14 years of age. Section C for readers of all ages residing Overseas.

We wish to remind intending competitors that it is not necessary to send the actual model; a good photograph or a clear drawing is all that is required. Please take special care to see that your age, name, and address appear on the back of each photograph or sheet of paper used, together with the letter A, B, or C, indicating the Section in which you are entering the model, and the name of the competition, i.e. "April" Model-building Contest. Photographs or drawings need not be your own work, but it is absolutely necessary that the model itself is your own unaided work.

If your model incorporates any special mechanical or structural features that are not brought out well in your photographs or drawings, be sure to include with your entry a short description that will make everything clear. The descriptions should be as short as possible consistent with lucidity.

Address the envelope containing your entry to "April Model-building Contest," Meccano Ltd., Binns Road, Old Swan, Liverpool. It should be noted that drawings or photographs of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned if a stamped addressed envelope of suitable size is enclosed with the entry.

Closing Dates

Readers residing in Great Britain and Ireland must forward their entries not later than 31st May, 1930. In order to give overseas entrants plenty of time in which to build the models we have extended the closing date for Section C to Saturday, 30th August, 1930.

The full lists of prize-winners will be published in the "*M.M.*" as soon after the closing dates as possible, and all successful competitors will be notified personally by letter. Prize-winning models will be described and illustrated in a future "*M.M.*," and if suitable will be included also in forthcoming Meccano Manuals.

THE PRIZES

The Prizes to be awarded in Sections A and C are as follows:—

First Prize: Cheque for £2-2s.
Second Prize: Cheque for £1-1s.
Third Prize: Cheque for 10/6.
Twelve Prizes, each consisting of Meccano products to value 5/-.
Twelve Prizes, each consisting of a copy of "Famous Trains."
Twelve Prizes, each consisting of a Meccano Engineer's Pocket Book.

The Prizes in Section B are as follows:—

First Prize: Cheque for £1-1s.
Second Prize: Cheque for 10/6.
Third Prize: Cheque for 7/6.
Six Prizes, each consisting of Meccano products to value 5/-.
Twelve Prizes, each consisting of a complete Instructions Manual.
A limited number of Certificates of Merit and complimentary copies of "Meccano Standard Mechanisms" Manuals will be awarded in each Section.

Scientific Apparatus in Meccano

Laboratory Apparatus made by Dr. Ernest Bade

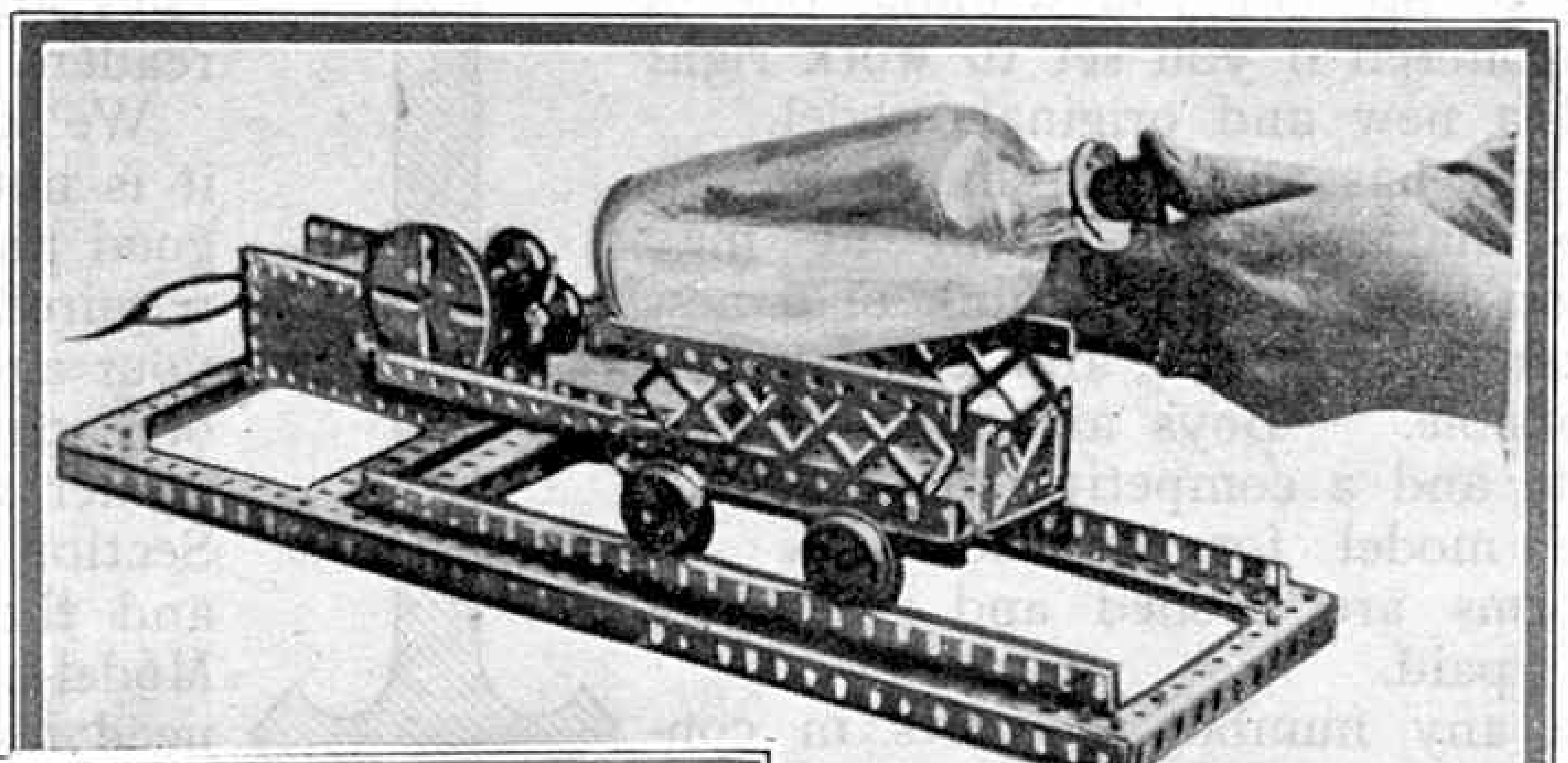
Some time ago we described a few of the many practical uses that have been found for Meccano in the field of science. These included the following devices constructed by Dr. Ernest Bade: Apparatus for electrocuting microscopic aquatic animals (see "M.M." for November, 1928); photo-micrographic device and a slide projector (January, 1929); and a microtome for cutting sections of animal tissue two thousandths of an inch thick (February, 1929). This month we are able to reproduce various interesting apparatus which Dr. Bade has constructed for use in chemical experiments.

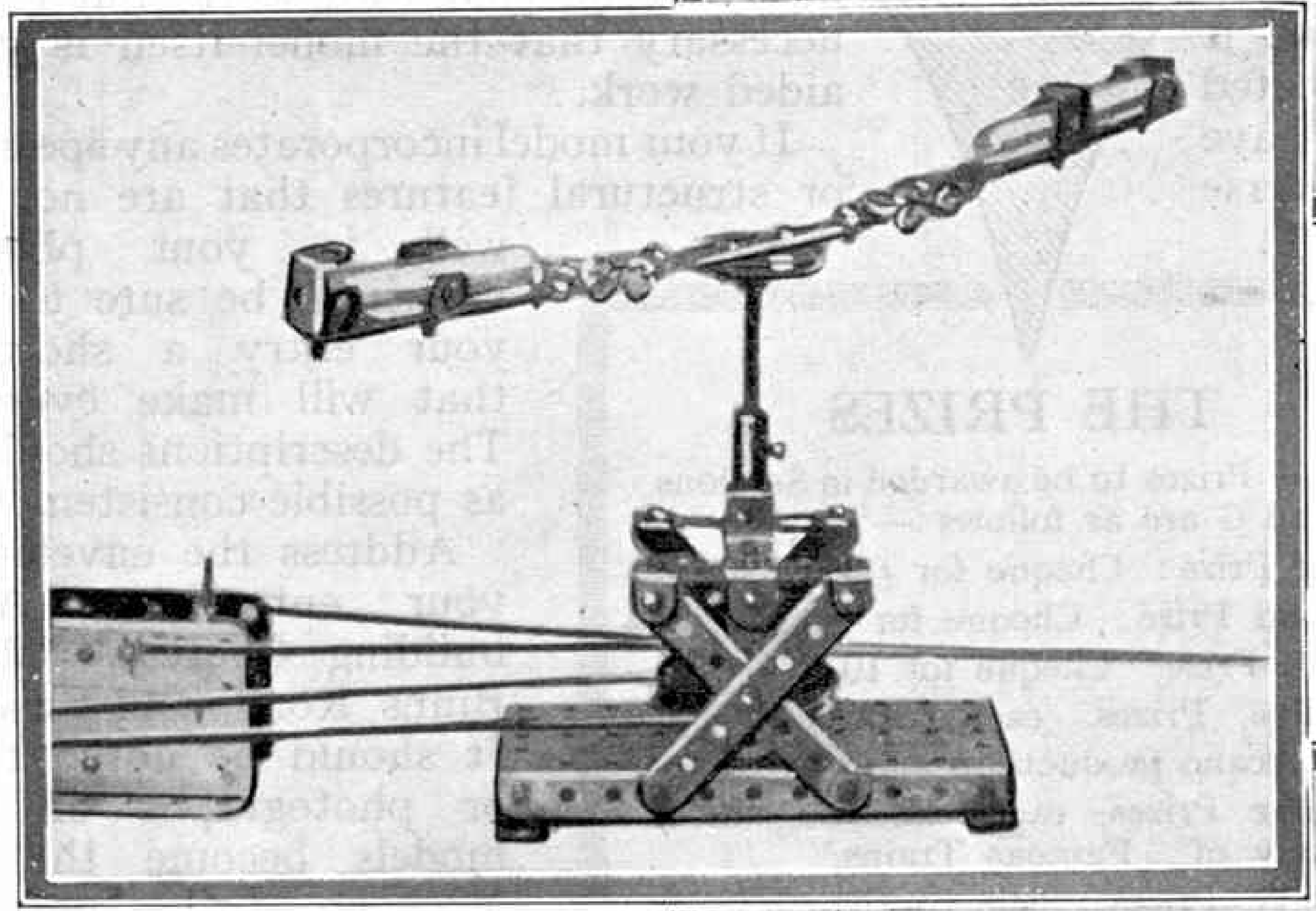
IV.—USEFUL MECHANICAL EQUIPMENT FOR THE AMATEUR CHEMIST

CHEMISTRY offers many advantages for the amateur who makes it his hobby and there must be a very large number of Meccano model-building enthusiasts who also obtain interest and instruction by carrying out some of the simpler experiments in this wide and fascinating branch of science.

Most of the various chemical substances that are required can be obtained in small quantities quite cheaply, and with the addition of a Bunsen, or even a spirit lamp, and a few glass vessels, test tubes, etc., the experimenter has all the essentials that are needed to start his hobby.

But just as the addition of a larger variety and quantity of parts enables the Meccano boy to extend his model-building activities, so a more comprehensive equipment will allow the amateur chemist to carry out more complicated and fascinating experiments, but alas! laboratory apparatus, like all other specialised equipment, is expensive, and in most cases quite beyond the pocket of the young chemist.





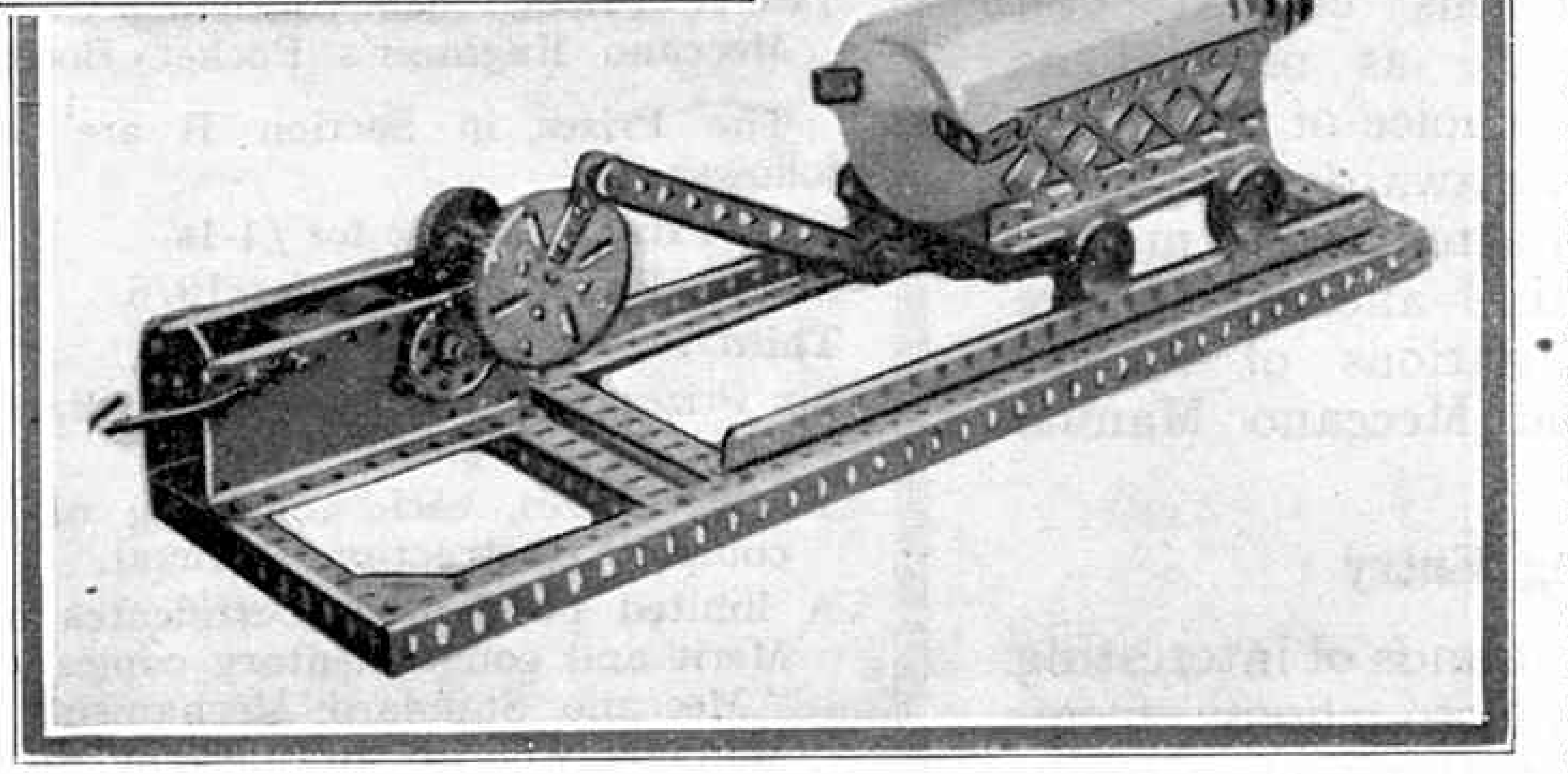


Fig. 1 (Above): Bottle Shaker with bottle in place. Fig. 2 (left): The Meccano Centrifuge in action. The test-tube holders have risen into a horizontal position owing to centrifugal force. Fig. 3 (below): Another view of the Bottle Shaker showing the oscillating gear.

It is the object of this article, therefore, to show how Meccano can be employed to meet the want of efficient and cheap apparatus for the amateur's laboratory. The great advantage obtained by using Meccano apparatus in place of manufactured equipment lies in the interchangeability of the parts. Suppose, for instance, the experimenter constructs the bottle shaker shown in Fig. 1 and after using it in carrying out a number of experiments, finds that it will not be required for some time. It will then be quite a simple matter for him to dismantle the shaker and build up some other piece of equipment that will fulfil his immediate needs. With manufactured apparatus this cannot be done, and when out of use it merely serves as a dust collector of the most expensive order!

Bottle Shaking Device

The bottle shaker (Fig. 1) is constructed entirely from Meccano parts. The framework consisting of 12½″ and 5½″ Angle Girders should first be assembled, and to it is bolted a Meccano Electric Motor and the pair of 12½″ Angle Girders that comprise the rails on which the carriage runs. It will be seen that a 5½″ × 2½″ Flanged Plate has been used as the base of the carriage carrying the bottle that is to be agitated, but the actual size of the carriage, will of course, be governed by the size of the bottle or flask. To the Flanged Plate four Trunnions are attached to form journals for two 3½″ Axle Rods carrying the four Flanged Wheels, and to either side of the Plate a 5½″ Braced Girder is fastened, while the front of the carriage is enclosed by two Corner Brackets. In this way the bottle will be held quite securely even when the carriage is oscillated at a good speed.

The oscillating mechanism (see Fig. 3) consists of a 5½″ Strip pivotally secured to a Single Bent Strip that in turn is fastened to the carriage. At its other end the Strip is secured by the means of a bolt and two lock-nuts to a 2½″ Strip bolted to a Face Plate, which is driven from the Electric Motor through reduction gearing consisting of two 57-teeth Gear Wheels and two ½″ Pinions. Upon setting the Motor in motion the Face Plate is rotated and alternately pushes and pulls the carriage holding the bottle, so shaking the contents of the latter. The device will be of particular use when it is required to agitate a liquid for prolonged periods, as for example, when it is required to dissolve a substance that is only slightly soluble.

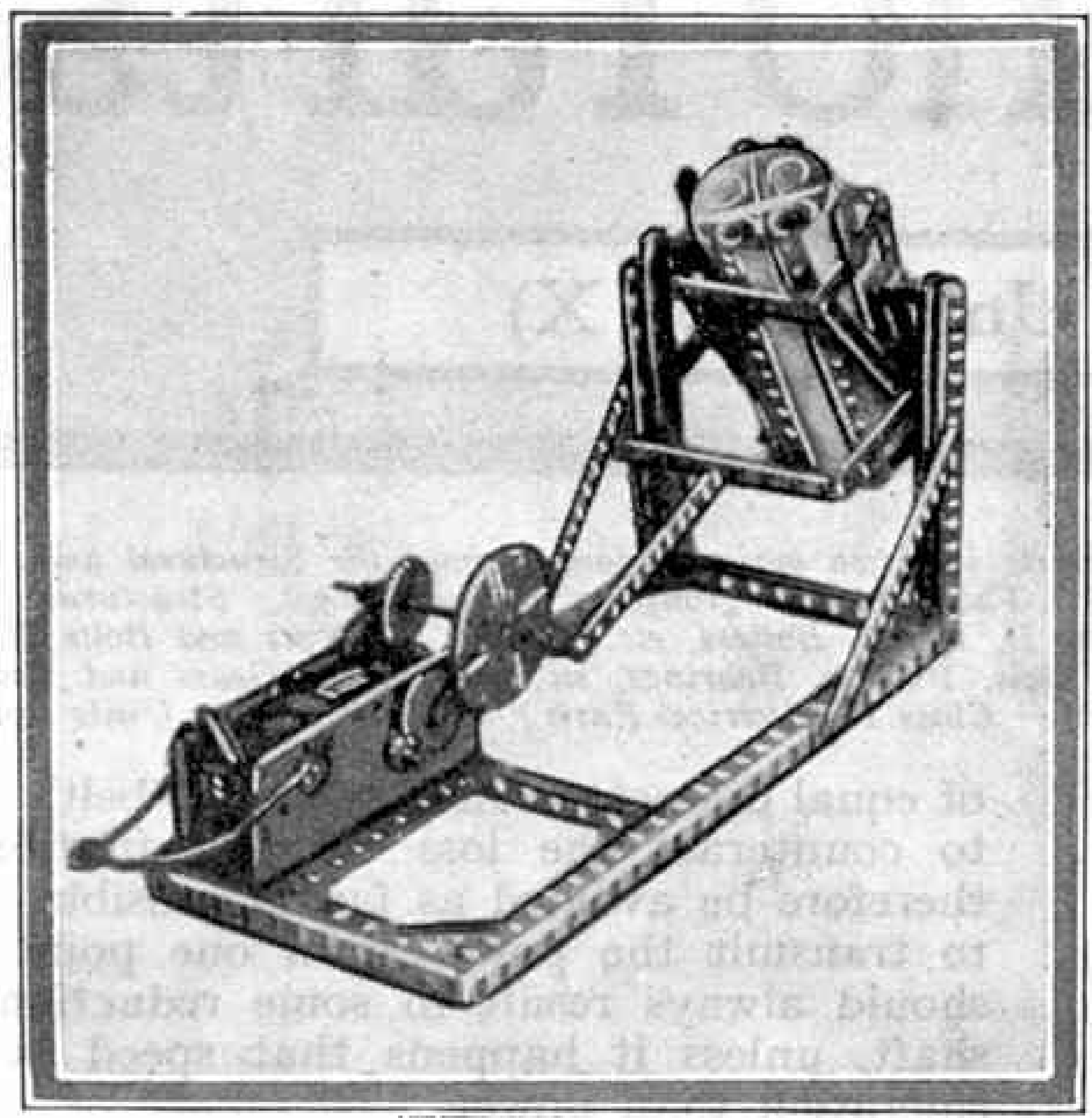
The Meccano Centrifuge

Another form of mixing device is the Centrifuge shown in Figs. 2 and 7. Two test tubes are placed in the holders of the apparatus and are then whirled round at high speed and the contents thoroughly mixed. The base of the Centrifuge consists of a 5½″ × 2½″ Flanged Plate over the centre of which is mounted a Double Bent Strip on a framework consisting of 2½″ Double Angle Strips and ordinary Strips. The Double Bent Strip forms a reinforced journal bearing for a vertical Axle Rod that carries a Bush Wheel at its upper end and a 3″ Pulley near its lower end.

The holders for the test tubes consist of 5½″ Strips to which are bolted Angle Brackets. At one end of each Strip a Double Bracket is secured, whilst a 1″ Triangular Plate is fastened to the other extremity. To the Bush Wheel that is secured to the vertical Axle

Rod a 3½" Strip is bolted, and a 1" Triangular Plate is fastened to each end of this Strip. Each holder is coupled to the 3½" Strip by means of two Hooks that are slipped into the holes of the Triangular Plates. This method of connection enables the holders to move freely and swing out by centrifugal force when the vertical Axle Rod is rotated sufficiently fast.

The Centrifuge is set in motion by means of the Electric Motor that can be seen mounted upon the table in Fig. 7. There are many methods of coupling the armature shaft to the 3" Pulley, but the one shown is perhaps the simplest, the cord being passed round the 3" Pulley and over a ½" fast Pulley on the armature shaft.



Test-Tube and Beaker Shakers

In Fig. 4 will be seen an alternative method of shaking the contents of test tubes. The method of constructing the base and oscillating mechanism is identical to that employed in the Bottle Shaker shown in Fig. 1. Hence it is easily possible to assemble the frame with Electric Motor and oscillating gear and use either the bottle carriage or test tube holder as occasion demands.

The test-tube holder consists of a framework of Strips that is pivoted on two short Axle Rods journalled in two 9½" upright Angle Girders. The test tubes are held in partitions constructed from stiff cardboard and are entirely surrounded by a strip of cardboard. When the Face Plate is rotated by the Electric Motor the connecting arm is drawn backwards and forwards and the holder containing the test tubes is rocked gently to and fro.

A further mixing device is shown in Fig. 5. In this case the oscillating mechanism previously described is employed to rotate a 6" Circular Plate, which acts as a table on which is placed a beaker filled with liquid. A Bush Wheel is first secured to the centre of the Circular Plate and a 3" Axle Rod slipped into its boss, a Collar being fastened to the Rod immediately below the Bush Wheel, so that the latter may rotate freely. The lower end of the Rod is secured in the boss of a second Bush Wheel bolted to a 5½" Angle Girder forming one of the ends of the base frame.

The Circular Plate is connected to the Face Plate by means of a specially shaped link built up as follows. A 1" × ½" Angle Bracket is first attached pivotally, by a bolt and two nuts, to one of the radial holes in the Circular Plate and to this is attached a 4½" Strip by means of a bolt and two nuts. To the other end of the 4½" Strip a Simple Bell Crank is bolted, and to the latter is secured a 3½" Strip, one end of which is pivoted to the Face Plate.

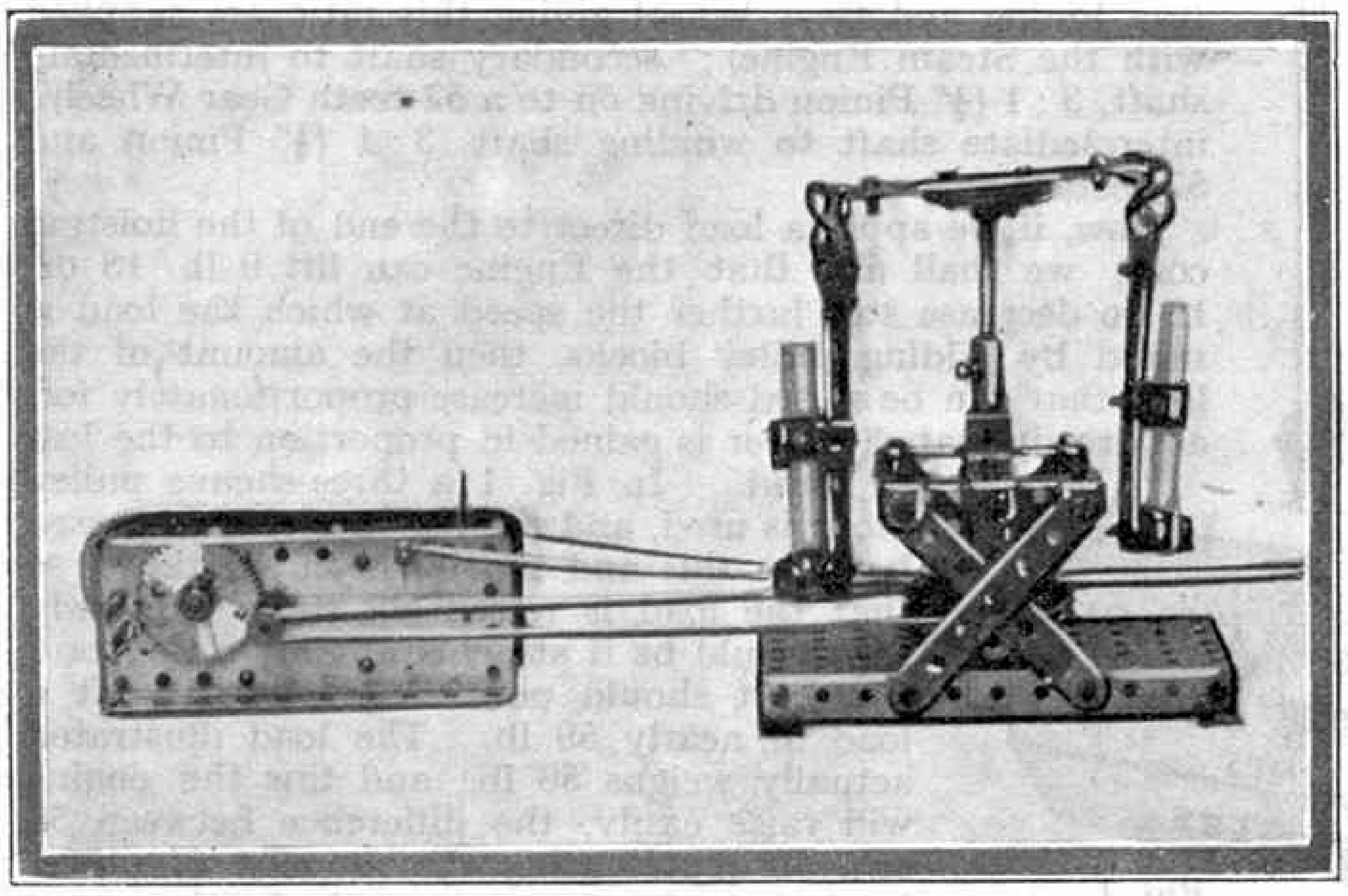
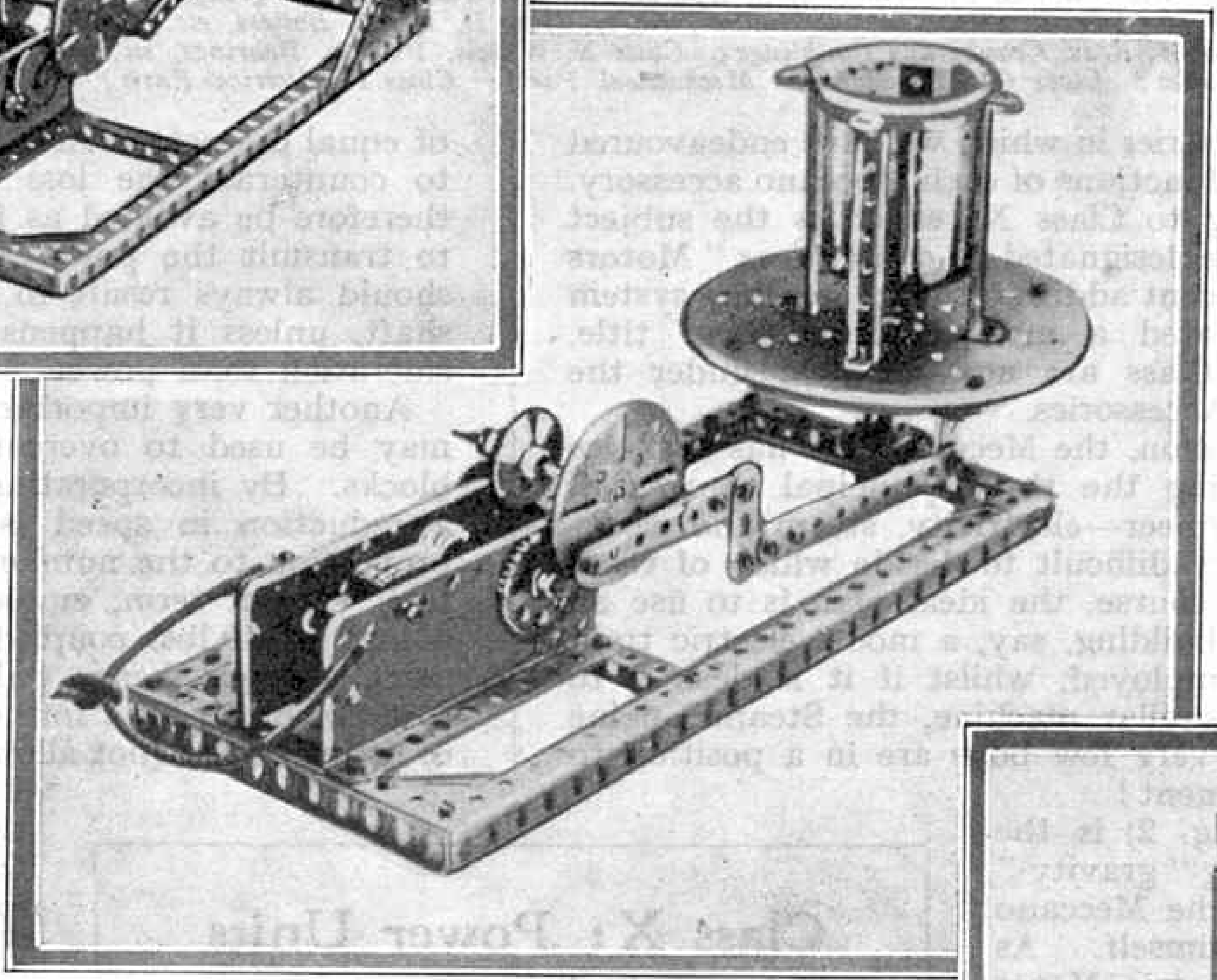


Fig. 7. Another view of the Meccano Centrifuge; mechanism at rest.

In order to support the beaker on the Circular Plate four 3½" × 1½" Double Angle Strips are secured to the Plate in such a position that the "lip" of the beaker just rests on their angle portions. As a precautionary measure, a rubber band or length of cord should be passed round the Angle Strips near the top so as to prevent the lip of the beaker slipping out of position. When the oscillating mechanism is set in motion the Plate carrying the beaker is given a backward and forward motion through a portion of a circle, and in this way any fluid that is placed in the beaker will be thoroughly mixed.

The remaining illustration represents a Meccano test-tube rack (see Fig. 6). This is certainly the simplest of all the apparatus illustrated, but at the same time its usefulness is unbounded, and it certainly constitutes a great improvement on the wooden racks, which are very difficult to keep clean. The rack shown in Fig. 6, is of course, only representative of this type of laboratory apparatus, and racks of any size and shape can be made to suit the experimenter's requirements.

The stand illustrated is 5½" long and is capable of holding three large diameter test tubes and five small size tubes. The tray on which the test tubes rest, comprises a 5½" × 2½" Flanged Plate, placed with its flanges upward, and to this is bolted the back and front of the rack. Four Angle Brackets are secured to the top Strip forming the front of the rack, and Flat Brackets are secured to these. Two Flat Brackets are secured in a similar manner to the back, and the complete rack is thus divided into eight separate compartments.



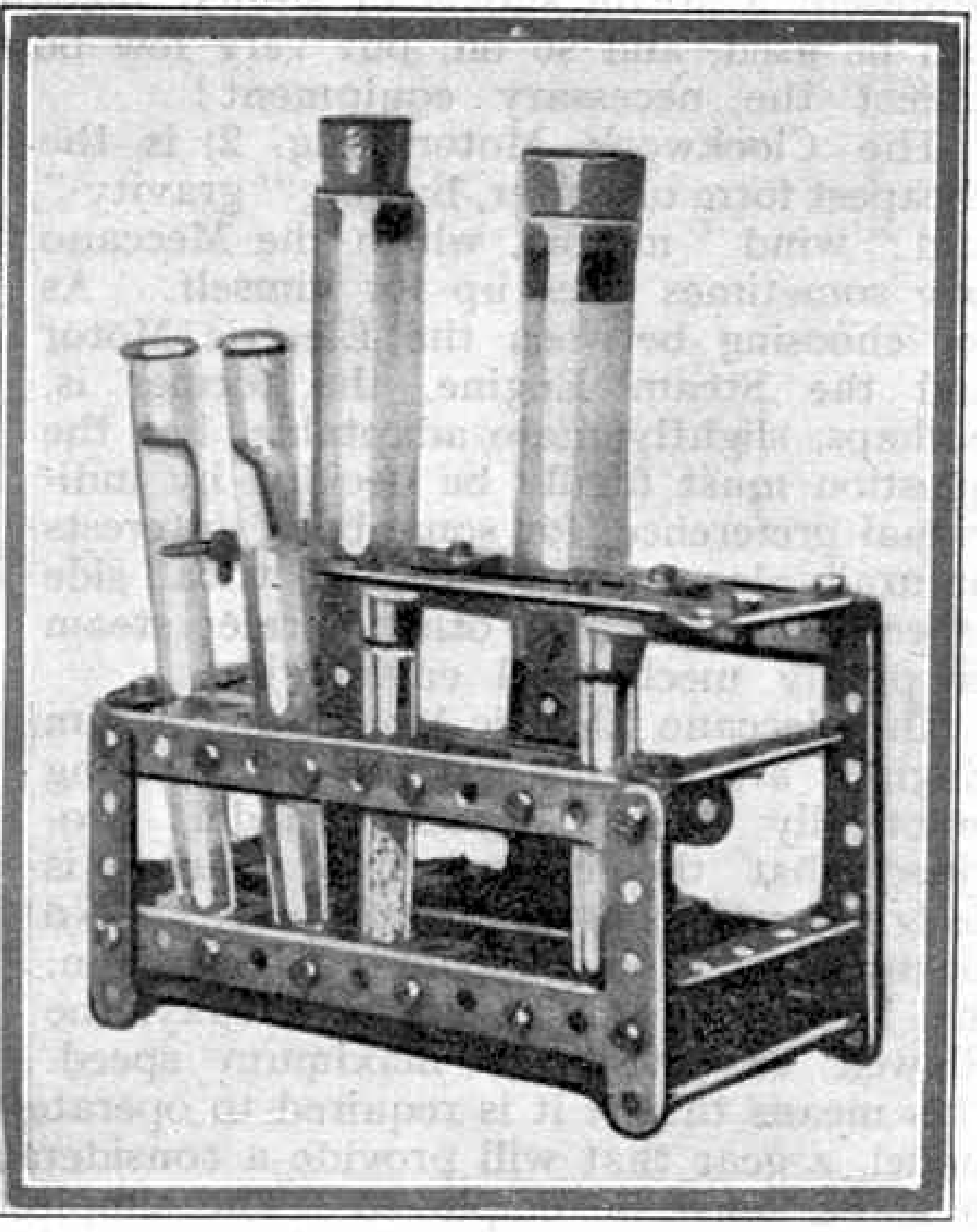


Fig. 4 (top left): An efficient test-tube shaking device. Fig. 5 (above): Apparatus for agitating the contents of a beaker. (It will be seen that this is an adaption of the Bottle Shaking Device shown in Fig. 1). Fig. 6 (right): An example of test-tube rack construction in Meccano.

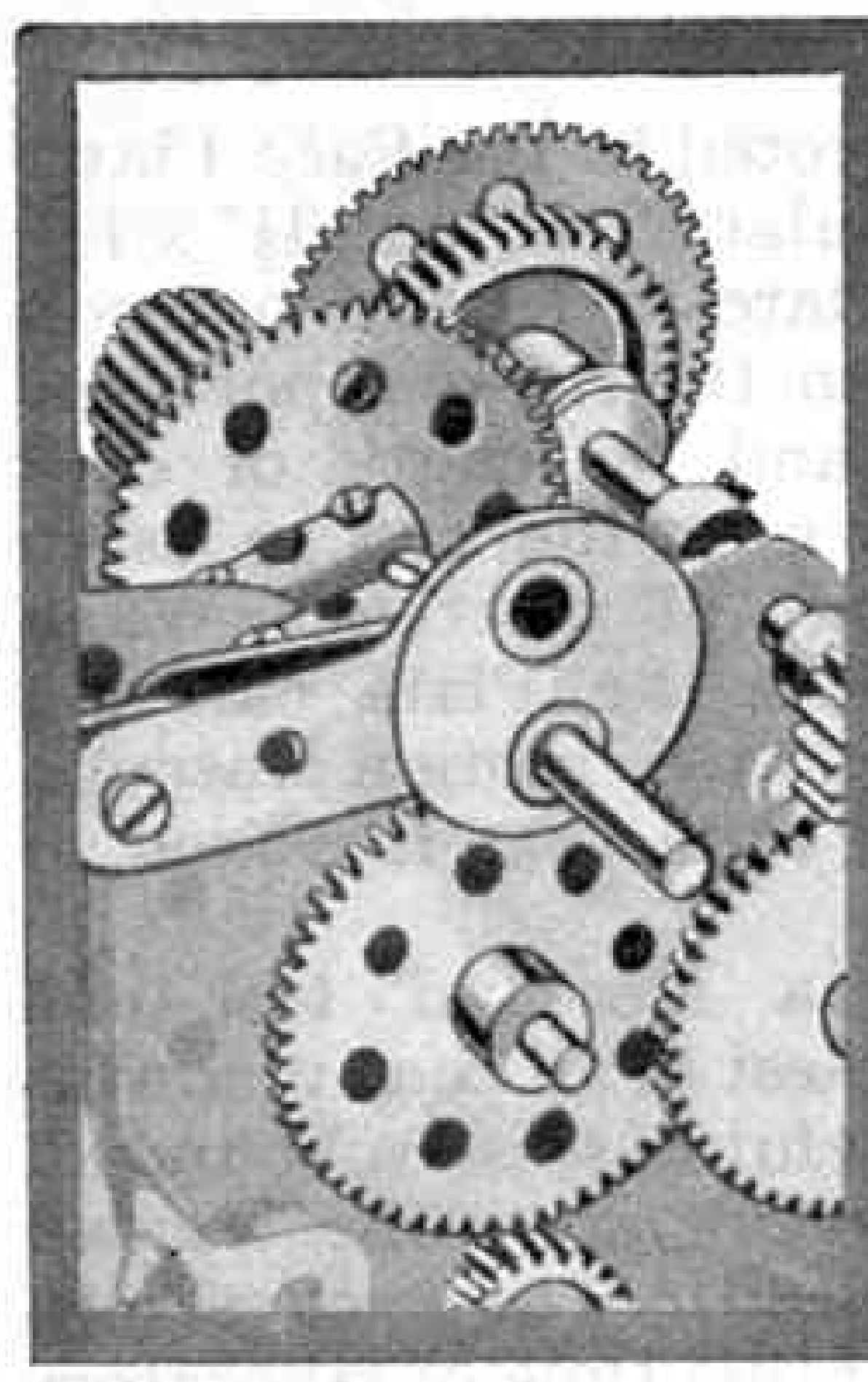
Test Tube Tweezers

The model just dealt with forms a solution to the problem of storing test tubes, but an equally troublesome task is that of holding the tubes securely when they are being heated over the Bunsen or spirit lamp. Meccano again comes to the rescue however, as a really efficient pair of test tube tweezers may be constructed from standard parts.

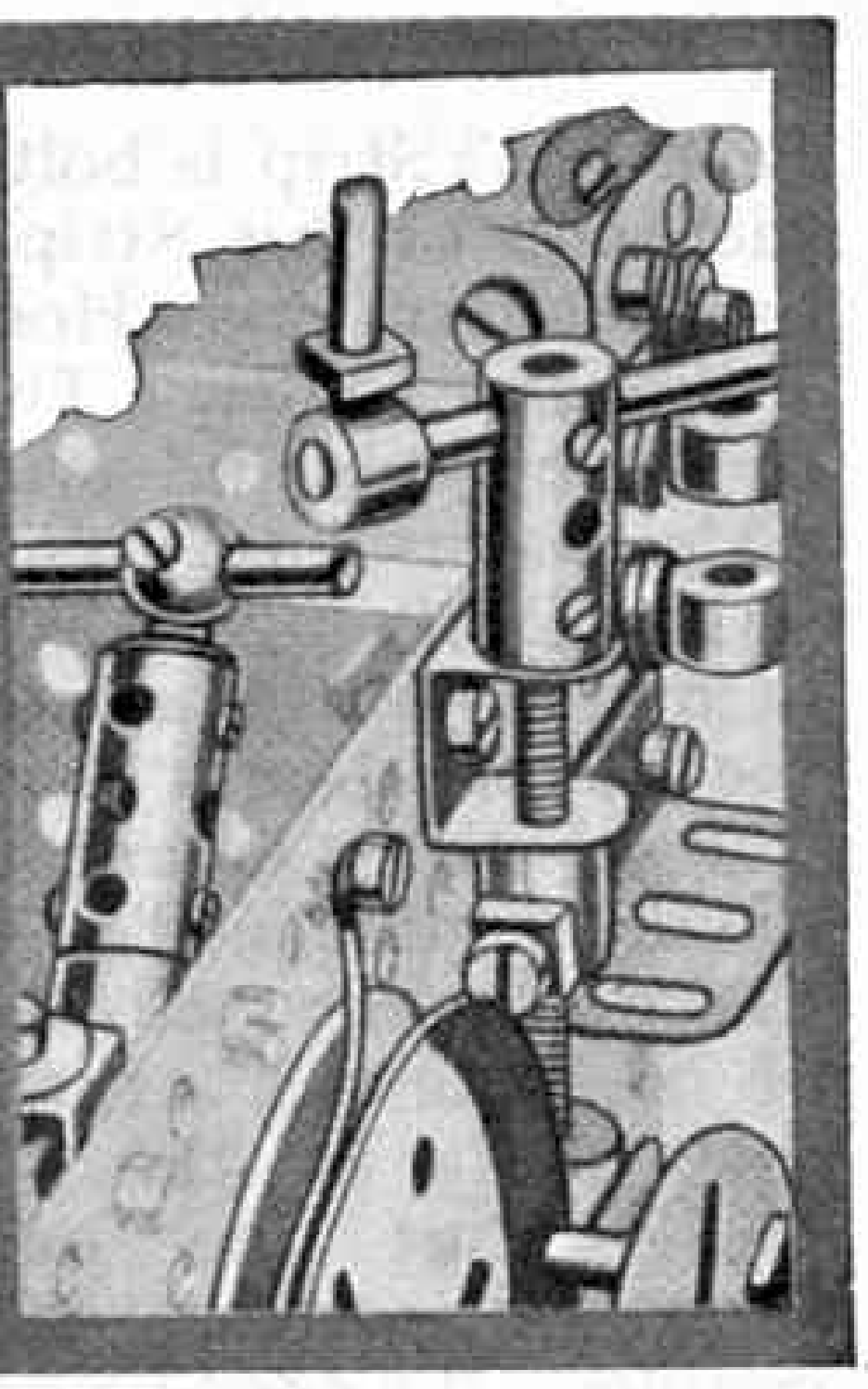
For the arms of the tweezers two 9½" Strips should be used, and these should be firmly bolted together at one end. If it is required to insulate the hand entirely from the heat of the Bunsen, the Strips should also be secured to a piece of wood that may be held in the hand, but this addition is not essential. The free ends of the Strips should be slightly curved so that they will fit round the test tubes and grip them securely.

In use, the tube is placed between the Strips, and a Single Bent Strip is placed over the Strips at the end furthest from the test tube, and is then gradually pushed forward, until the curved ends of the Strips are brought into close contact with the outer walls of the test tube, thus gripping it securely.

Every young experimenter who has experienced the unpleasantness of burnt fingers and broken test tubes through lack of a holder, will agree that although the simplest, these tweezers form one of the most useful examples of the Meccano 'Aids to Better Chemistry.'



HOW TO USE Meccano Parts



XIV.—Power Units (Class X)

For the purpose of this series of articles we have grouped all the Meccano parts into two main sections, termed the Structural and Mechanical Sections, and these sections have been further divided into a number of separate classes. The complete grouping is as follows. Structural Section: Class A, Strips; Class B, Girders; Class C, Brackets, Trunnions, etc.; Class D, Plates, Boilers, etc.; Class E, Nuts and Bolts, Tools and Literature. Mechanical Section: Class M, Rods, Cranks and Couplings; Class N, Wheels, Pulleys, Bearings, etc.; Class O, Gears and Toothed Parts; Class P, Special Accessories; Class Q, Miscellaneous Mechanical Parts; Class T, Electrical Parts; Class X, Power Units and Accessories.

THIS is the final article of a series in which we have endeavoured to describe the principal functions of each Meccano accessory.

Hitherto, when referring to Class X, which is the subject of this month's article, we have designated its contents as "Motors and Accumulators," but the recent addition to the Meccano system of a Steam Engine necessitated a more comprehensive title. Therefore the units in this Class are now grouped under the heading "Power Units and Accessories."

For setting his model in motion, the Meccano boy has a choice of "prime movers" employing the three principal sources of power used by the model engineer—electricity, steam and clockwork. Many boys find it very difficult to decide which of these three methods to adopt. Of course, the ideal plan is to use all three methods, so that when building, say, a model electric train the Electric Motor can be employed, whilst if it is desired to represent a steam shovel or similar machine, the Steam Engine can be used, and so on, but very few boys are in a position to collect the necessary equipment!

The Clockwork Motor (Fig. 2) is the cheapest form of power, barring "gravity" and "wind" motors, which the Meccano boy sometimes fixes up for himself. As for choosing between the Electric Motor and the Steam Engine, the former is, perhaps, slightly more adaptable, but the question must finally be decided by individual preference, for some boys' interests naturally lean toward the electrical side of engineering whilst others prefer steam or purely mechanical engineering.

Class X: Power Units and Accessories

		s.	d.
Electric Motor No. 6, 6-volt	each	15	6
Electric Motor No. 20, 20-volt ...	,,	21	0
This new Meccano accessory is not yet available, but it is hoped to have supplies ready next month.			
Accumulator, 6-volt, 20 ampere-hours	,,	28	6
Transformer, for 6-volt Motor... ...	,,	30	0
Resistance Controller	,,	4	6
Clockwork Motor	,,	7	6
Steam Engine	,,	25	0

The Meccano Electric Motors and Steam Engine are each capable of driving practically every Meccano model, provided that the intermediate gearing is designed and constructed properly. No matter what type of model is to be driven, the Motor or Engine should always be allowed to rotate at maximum speed. This means that if it is required to operate a slow-moving model, a gear that will provide a considerable reduction in speed must be employed. The simplest means of obtaining the necessary reduction is provided by the ordinary Meccano toothed gearing (see Section 1, Standard Mechanisms Manual). If gears are not available the drive from the Motor can be transmitted through belt mechanism, and the speed can be reduced at the same time by taking the drive from a small Pulley to one of much larger diameter (see Section 2, Standard Mechanisms Manual). Sprocket Wheel and Chain gearing may, of course, be used equally well in place of belts. Meccano gearing was dealt with fully in articles VIII and IX of this series.

How to Cope with Heavy Loads

Whatever type of gearing is employed it is important to remember that, if the driven shaft moves more slowly than the driving shaft, a mechanical advantage is obtained and increased loads may be overcome, the apparent gain in power being roughly in proportion to the loss in speed. If the drive is led through 1 : 1 gearing (i.e., two Gears of equal size meshing together or two Pulleys of equal diameter connected by a belt), there is no gain in power to counteract the loss through friction. Such gearing should therefore be avoided as far as possible, and when it is necessary to transmit the power from one point to another, the gearing should always result in some reduction in speed in the driven shaft, unless it happens that speed is a more important consideration than power.

Another very important means by which the Engine or Motor may be used to overcome increased loads, consists of pulley blocks. By incorporating a cord and pulley system in a model, a reduction in speed is obtained, the reduction increasing in proportion to the number of pulleys or "sheaves," to give them their correct term, employed. For example, if a crane can lift a load of 10 lbs. coupled directly to the hoisting cord, then by using a single-sheave pulley block, so that the load is raised in just twice the time formerly taken, the model should be capable of lifting 20 lbs. (not allowing for loss through friction). Similarly, if a two-sheave pulley block is used so that the crane hook is raised in four times the period occupied originally, then a load of nearly 40 lb. could be raised. Therefore the mechanical advantage is "2" and "4" respectively in these examples.

Of course, the same mechanical advantage could be obtained by using extra gearing and retaining the single hoisting cord, but the use of the pulley blocks is the better method, for it is more economical and it has the very important advantage of distributing the load over several lengths of cord instead of one only, with the result that a lighter and more flexible cord can safely be used.

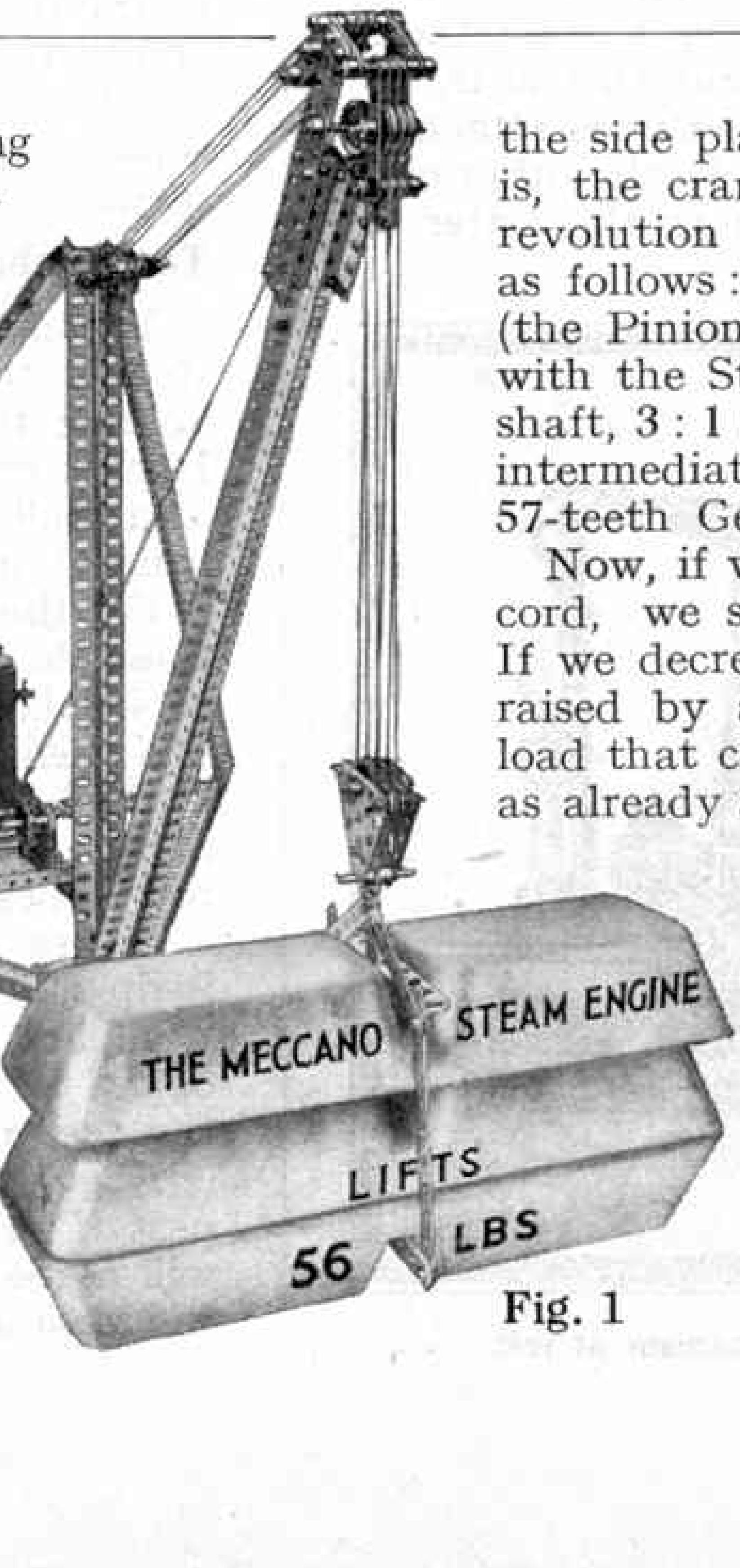


Fig. 1

Fig. 1 shows the Steam Engine applied to the Meccano Stiff Leg Derrick (see Special Instruction Leaflet No. 6). In this case the gearing mounted between the side plates of the Engine gives a ratio of 58.5 : 1, that is, the crankshaft of the Engine turns $58\frac{1}{2}$ times to each revolution of the winding shaft. This ratio is obtained as follows: Engine crankshaft to secondary shaft, 6.5 : 1 (the Pinion and Gear Wheel giving this ratio are supplied with the Steam Engine); secondary shaft to intermediate shaft, 3 : 1 ($\frac{1}{2}''$ Pinion driving on to a 57-teeth Gear Wheel); intermediate shaft to winding shaft, 3 : 1 ($\frac{1}{2}''$ Pinion and 57-teeth Gear).

Now, if we apply a load direct to the end of the hoisting cord, we shall find that the Engine can lift 9 lb. 13 oz. If we decrease still further the speed at which the load is raised by adding pulley blocks, then the amount of the load that can be raised should increase proportionately for, as already stated, power is gained in proportion to the loss in speed. In Fig. 1 a three-sheave pulley block is used, and the hoisting cord is passed between this and the jib head six times, so that the load is raised six times as slowly as it would be if attached direct to the cord. Hence it should now be possible to lift a load of nearly 59 lb. The load illustrated actually weighs 56 lb., and this the engine will raise easily, the difference between 56 and 59 representing the amount of power lost through the increased friction now existing in the various working parts of the model.

Meccano boys who have built the model Motor Chassis (Special Instruction Leaflet No. 1) will readily appreciate the importance of gear ratios when fitting motors to Meccano models. The chassis has three forward speeds, and the very great difference in the load that can be carried at the different speeds is obvious.

Hauling a Tremendous Load

A striking illustration of the power of the Meccano 6-volt Electric Motor is afforded by the Traction Engine (Special Instruction Leaflet No. 22). This model has two forward speeds. In the first a total ratio between the Motor armature and back axle of 283.5 : 1 is obtained, but the second provides the big ratio of 567 : 1, and with this gearing truly great loads can be overcome. The Traction Engine has been made to pull over a hard, smooth surface a load of no less than 10 stone, excluding its own weight and that of the accumulator and ballast. The latter, which was necessary to obtain sufficient adhesion on the ground, consisted of lead blocks fitted inside the boiler. Fig. 8 shows the Traction Engine hauling its driver along.

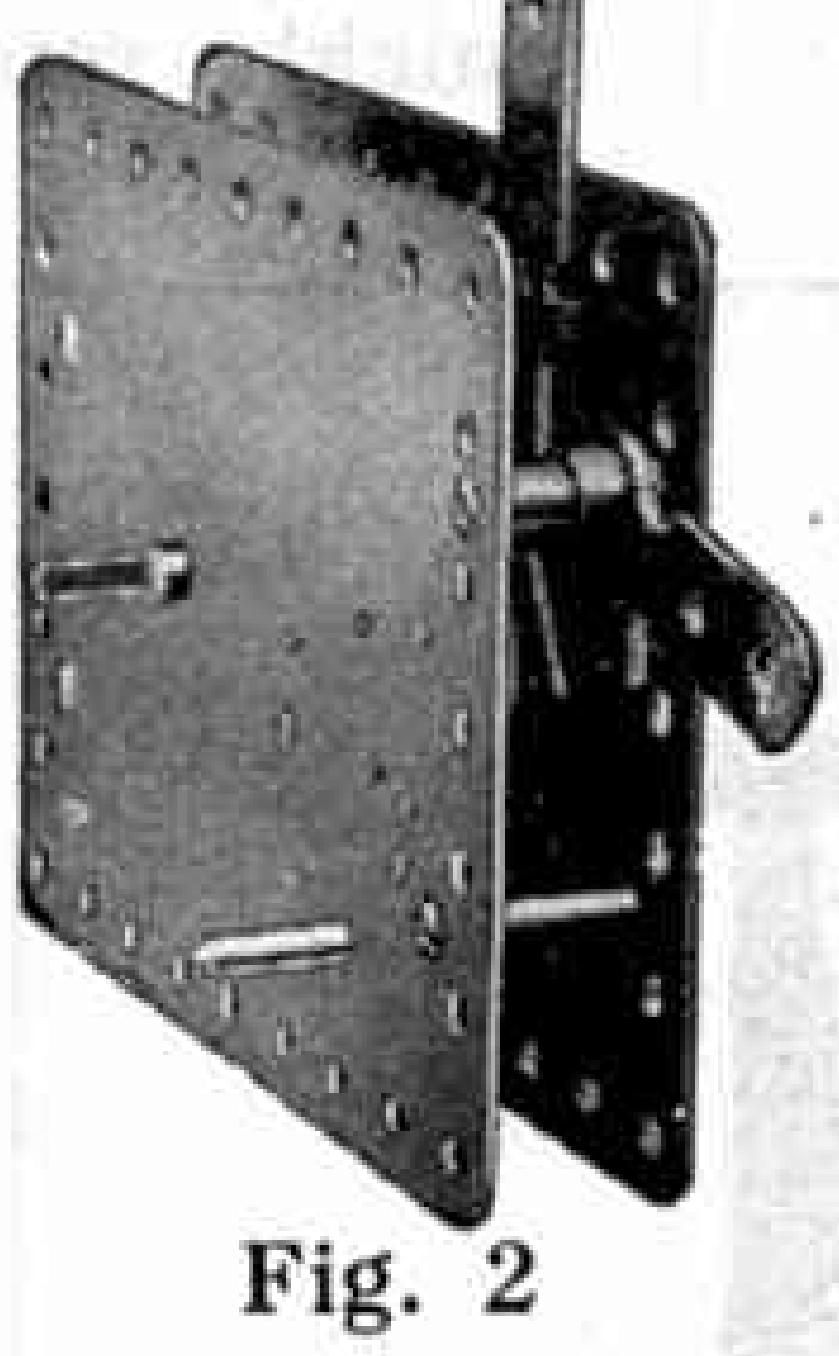


Fig. 2

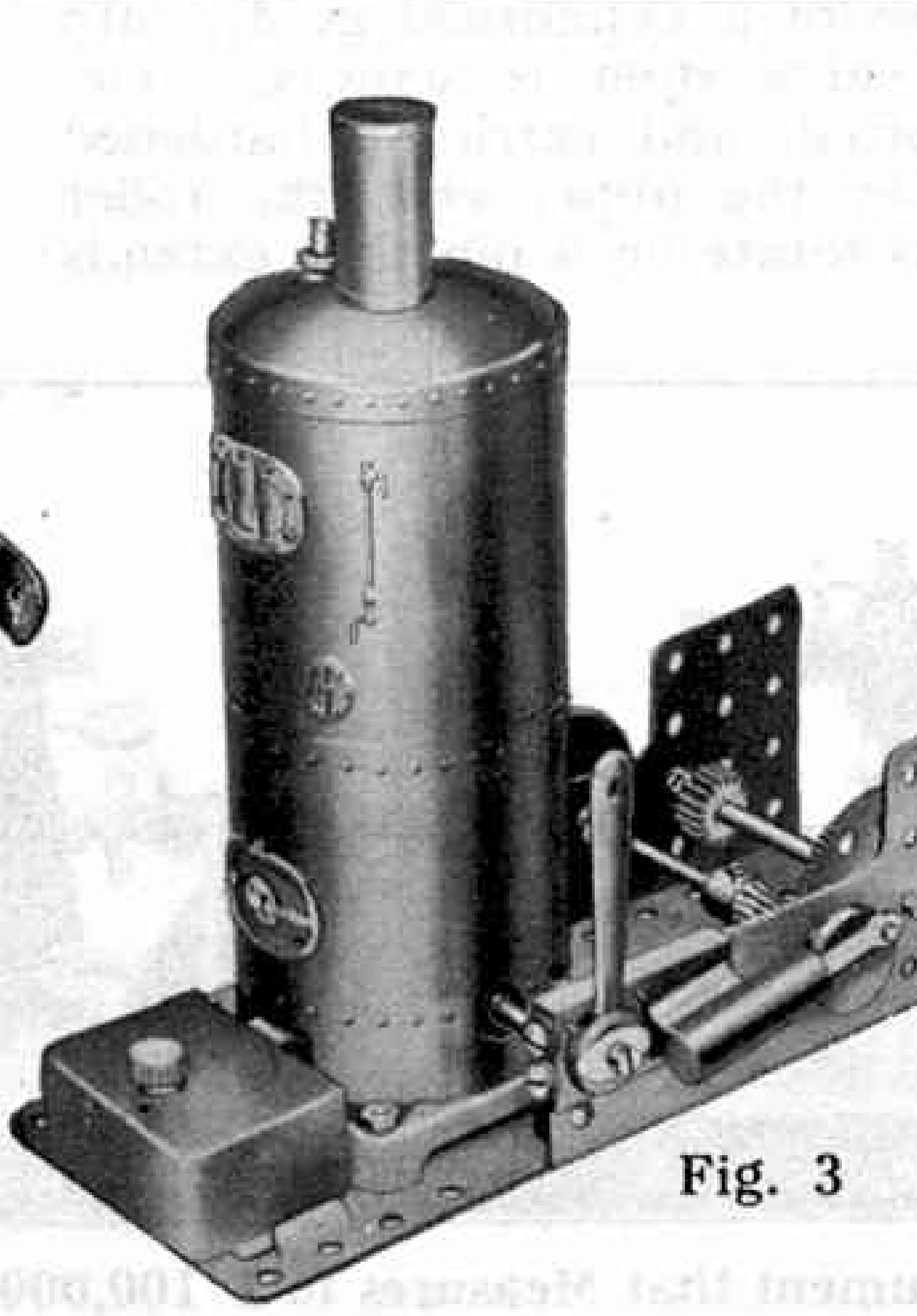


Fig. 3

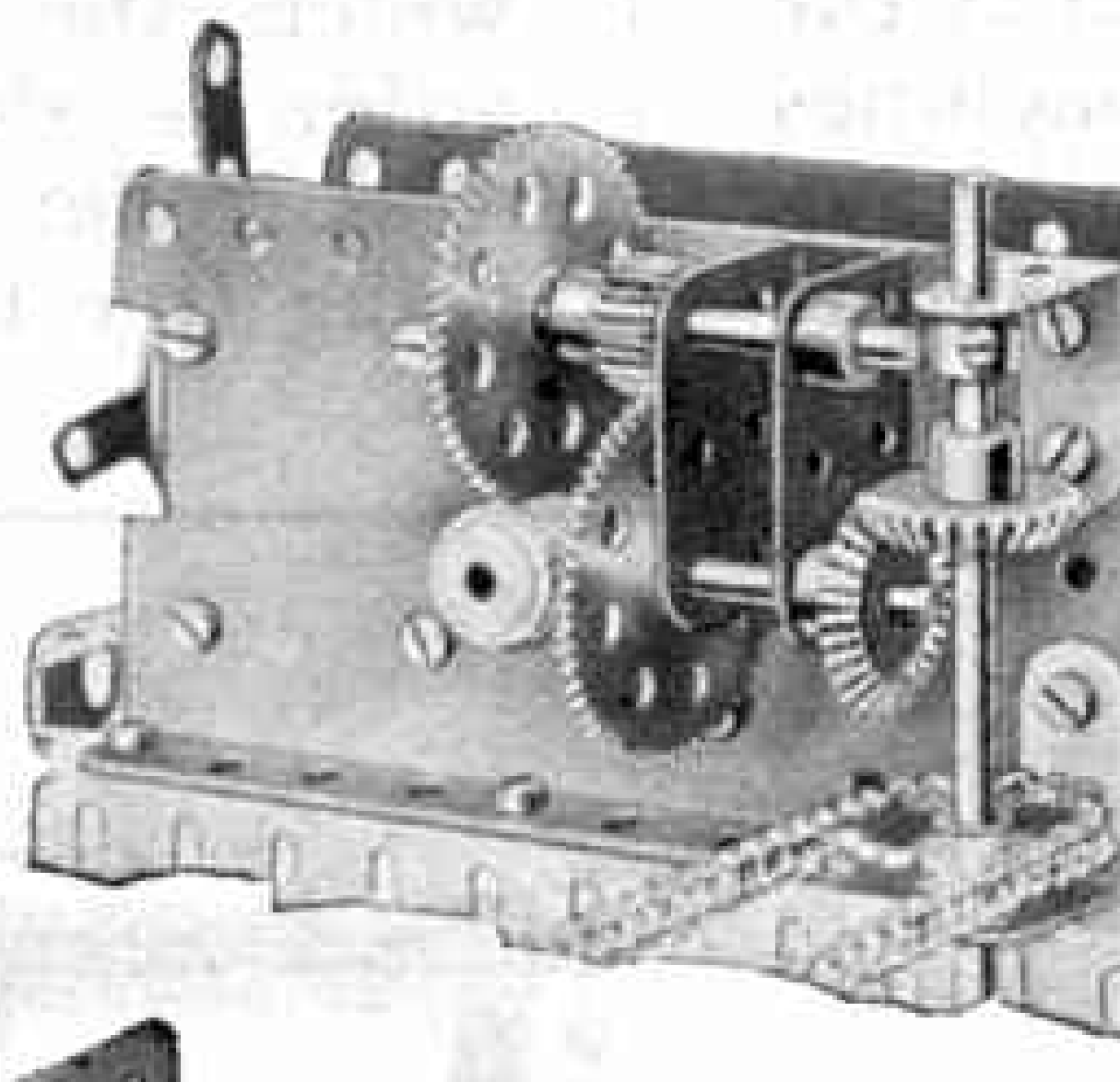


Fig. 4

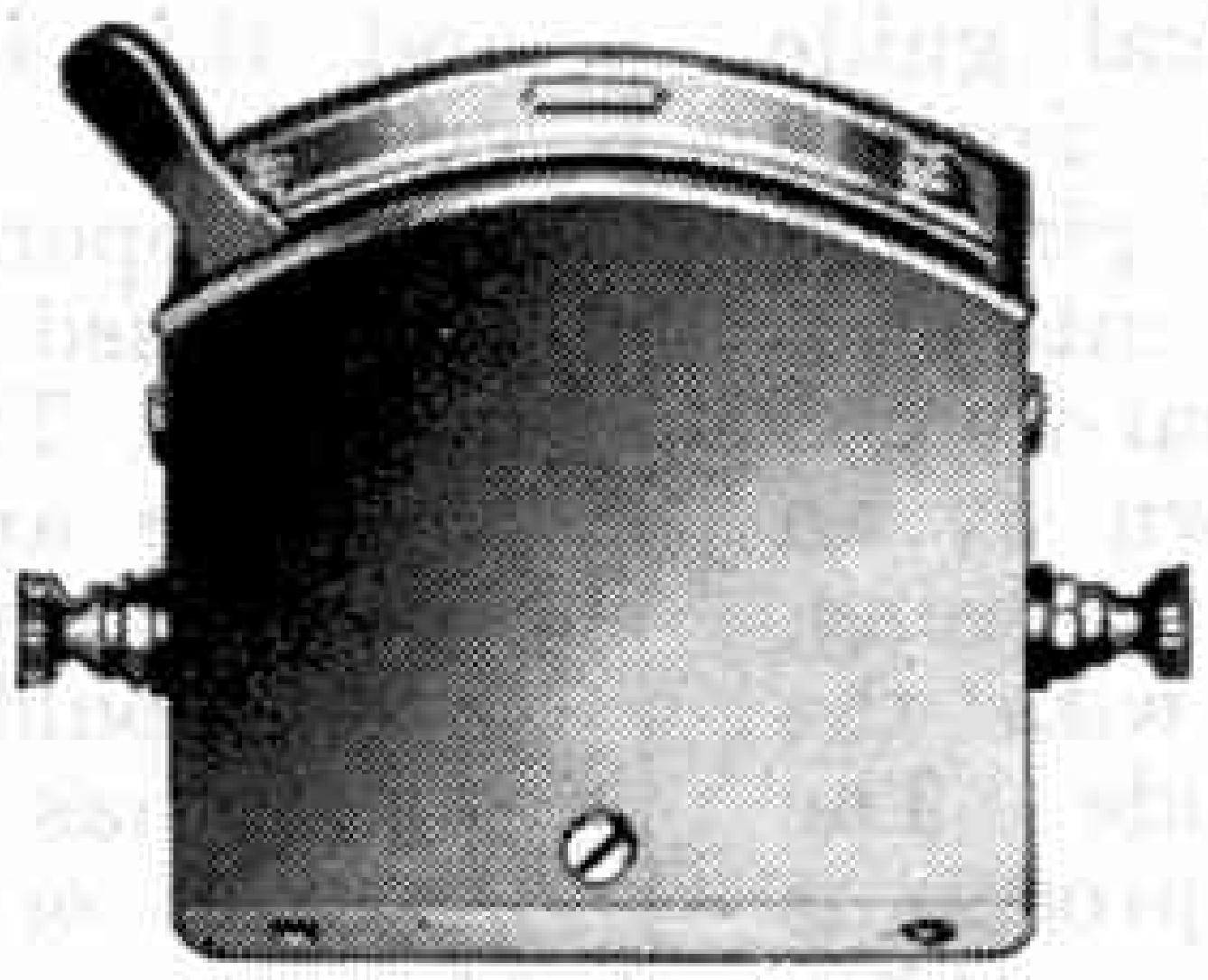


Fig. 5

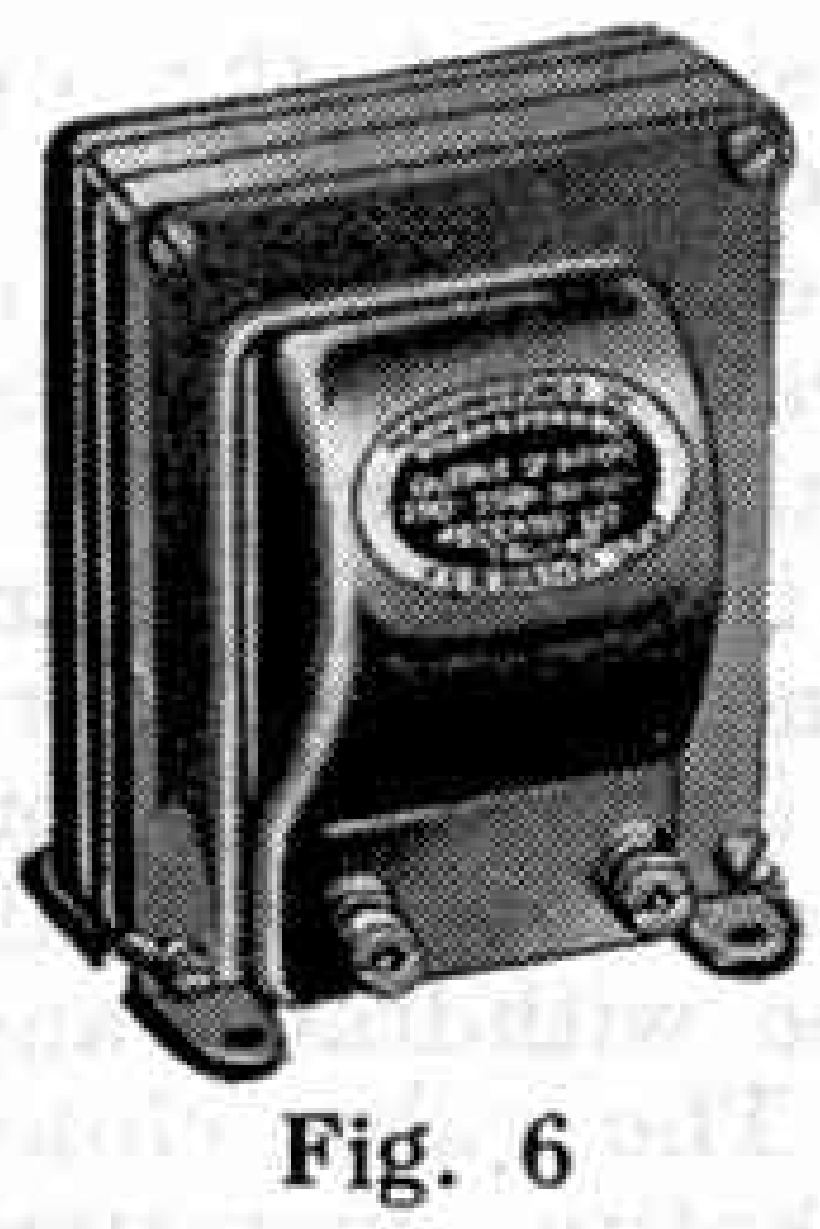


Fig. 6

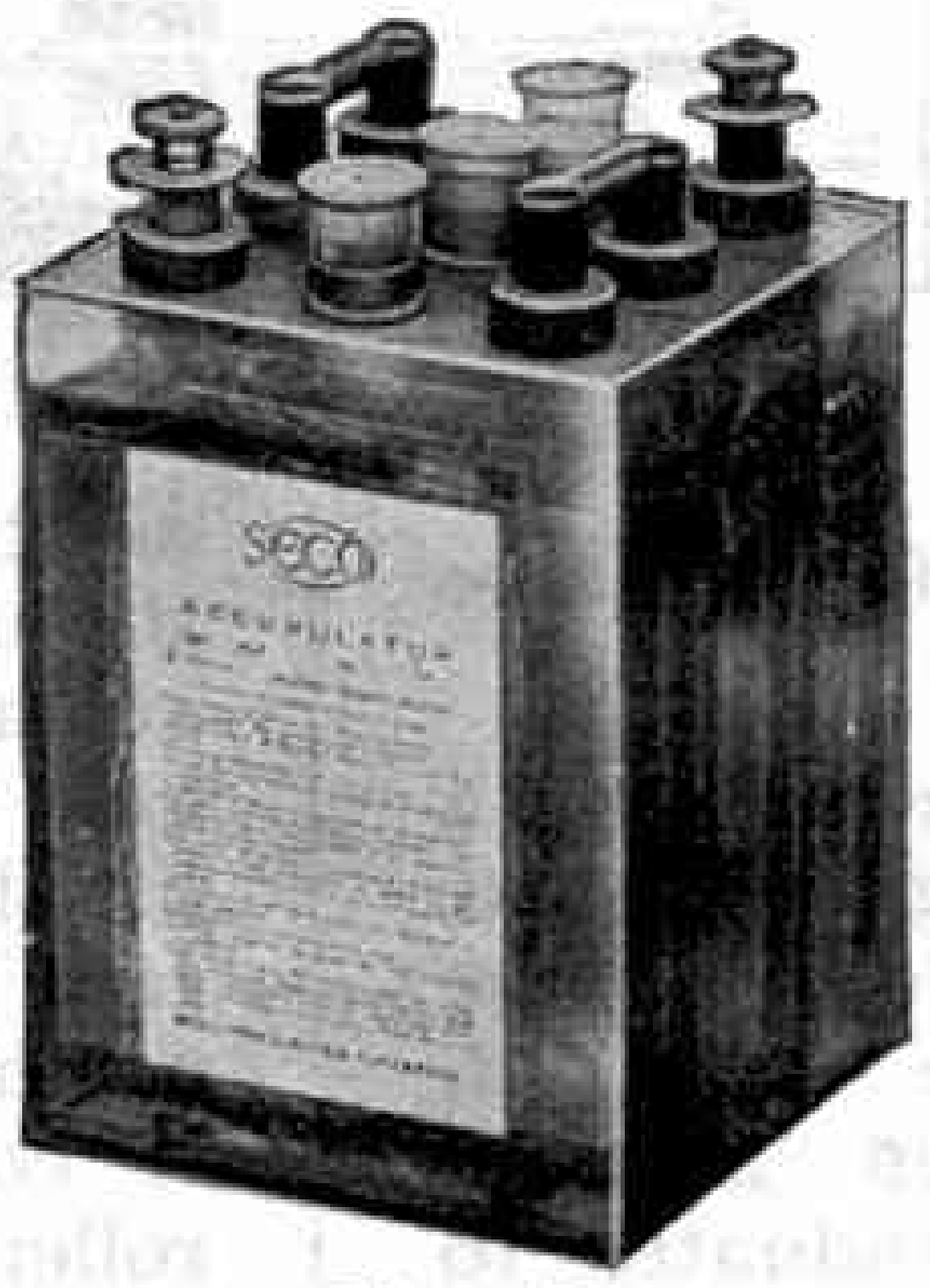


Fig. 7

The two Meccano Electric Motors are described as Nos. 6 and 20 merely for easy reference purposes. They are identical in every way except for the windings and both are fitted with reversing switches. The side plates measure 5″ × 2½″ and are perforated with the Meccano standard holes. Hence the Motors may actually form parts of the models that they are required to drive, and they can be bolted in any position. In the Traction Engine the Motor is secured on end at the rear of the boiler, in the position occupied by the fire box in the prototype, and the holes in its plates form bearings for the engine crankshaft and other parts. Fig. 4 shows an Electric Motor fitted with typical reduction gear giving a ratio of 171 : 1, the bearings for the various shafts being provided by a Channel Bearing and two 1″ × 1″ Angle Brackets bolted to one of the Motor side plates.

The 6-volt Motor may be run from a 6-volt accumulator or from a suitable transformer connected to the main electric house supply, provided that the latter is alternating current. The Motor takes about 0.8 amperes when running free, but on load this increases up to 2.5 amps. Fig. 7 shows the Meccano 6-volt 20 ampere-hour Accumulator, and Fig. 6 the special Meccano Transformer designed for running the 6-volt Motor from the house supply. This transformer is available for all standard supply voltages from 100 to 250 inclusive at all standard frequencies, and is supplied complete with a length of flex and adapter for connection to an ordinary lamp socket.

The 20-volt Electric Motor is an entirely new addition to the Meccano system. It is designed for running from the main supply through a transformer, and is slightly more powerful than the 6-volt Motor. We hope shortly to be able to supply a transformer for use in connection with it, and particulars and prices of this accessory will appear in an early issue of the "*M.M.*"

Accumulator or Transformer?

With regard to the rival merits of the two methods of running the 6-volt Motor—by accumulator or transformer—the following points should be noted. In models that are required to travel along, such as motor cars, traction engines, etc., an accumulator can be incorporated in the model or carried on a trailer behind it, and the model then becomes a self-contained power unit. The accumulator, however, will require charging at intervals. A transformer can be neatly stored in a model, but the radius of movement will always be limited by the length of the flex to the lamp socket. When using a transformer with normal loads on the Motor, the consumption of current will be something like one unit per 20 hours. The Meccano 6-volt 20 amp. Accumulator will drive the Motor continuously for 10 or 15 hours, so it will be seen that whichever method is adopted, the running of Meccano Electric Motors is not an expensive matter.

Until recently a 4-volt Meccano Motor was supplied but this has been converted to the new 6-volt type. There are many Meccano boys who still possess 4-volt Motors and we would remind them that they can have their Motors converted to the new style at a cost of 3/6 (including return postage). They should hand their Motors to their dealers or forward them direct to the Service Department, Meccano Ltd. Also, to enable these boys to use their 4-volt Accumulators for the new Motors, we supply a special 2-volt Accumulator (price 10/6) which may be connected to their 4-volt cells.

A very useful gadget for use in connection with the 6-volt Electric Motor is the Resistance Controller (Fig. 5). By connecting this in series with the Motor the speed of the latter can be varied.

The Steam Engine (Fig. 3) possesses several features of interest, foremost among which is the single control lever that enables the Engine to be started, stopped, and reversed. The boiler proper is mounted centrally in the boiler casing so that the hot gases from the lamp surround it for practically the whole of its outside surface.

The Clockwork Motor

Finally, we come to the Clockwork Motor. This is an ideal power unit for many models. It is strong, easily built into almost any model, and of course, is entirely self-contained. The remarks already given regarding the gearing to be used in connection with the Meccano Electric Motors and Steam Engine refer equally well to the Clockwork Motor, but if considerable loads are to be overcome, one must expect to have to wind the Motor frequently.

Where only a light driving power is required, the period during which the Motor will run for each winding can be increased enormously by using a suitable governing device. One of the simplest of such devices consists of a fan wheel driven by the Motor, the resistance of the atmosphere against the blades of the fan being used to prevent the Motor exceeding a certain speed, with the result that it will run for 10 minutes or more at a single winding. The fan wheel can easily be built up from Meccano parts, but the actual blades should consist of stout cardboard, or Meccano Strips covered with cardboard. Another way to regulate the speed of the Motor is to employ some form of governing device consisting of a friction brake that is applied by the action of weights flying outward under centrifugal force (see Standard Mechanism No. 107).

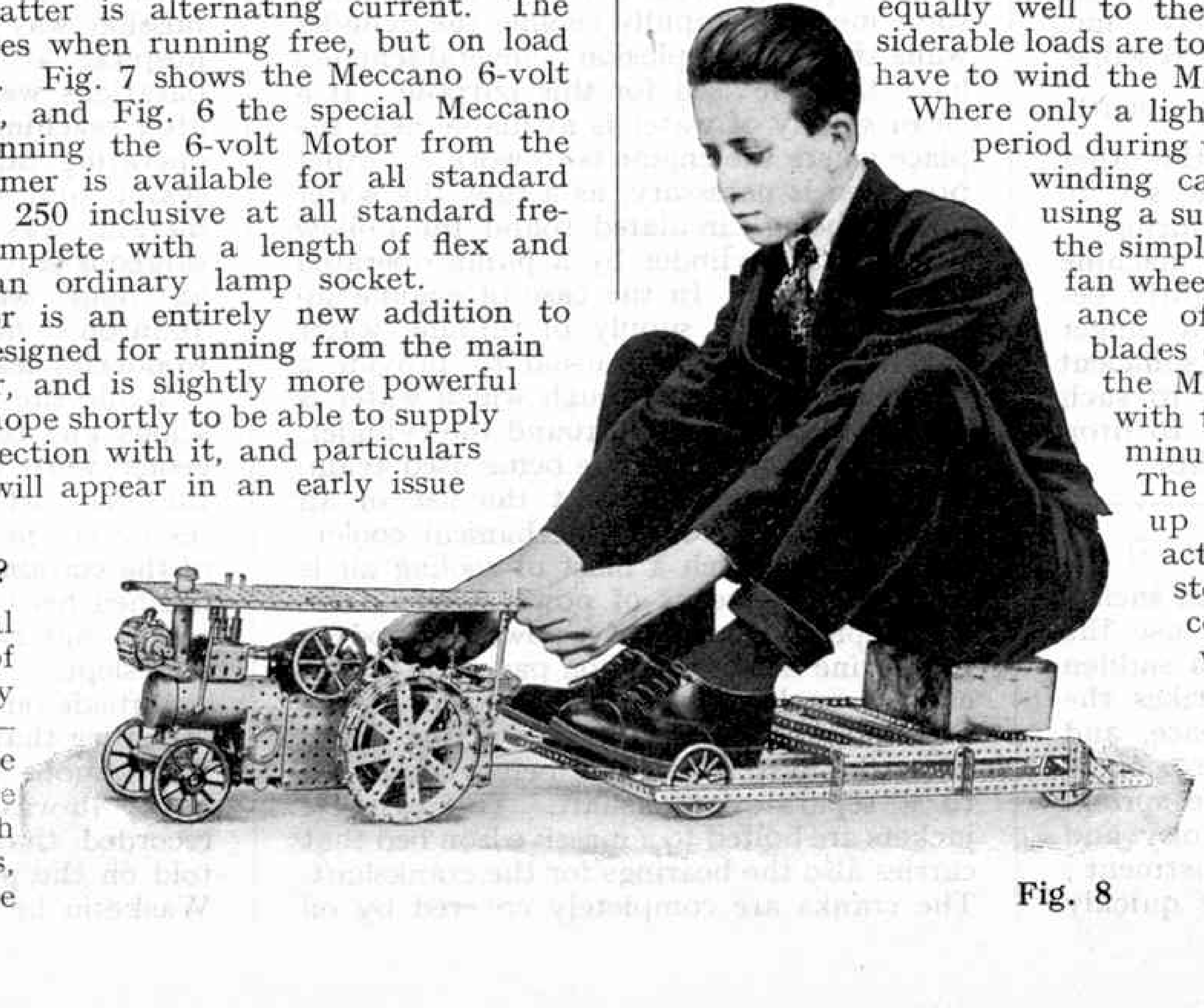
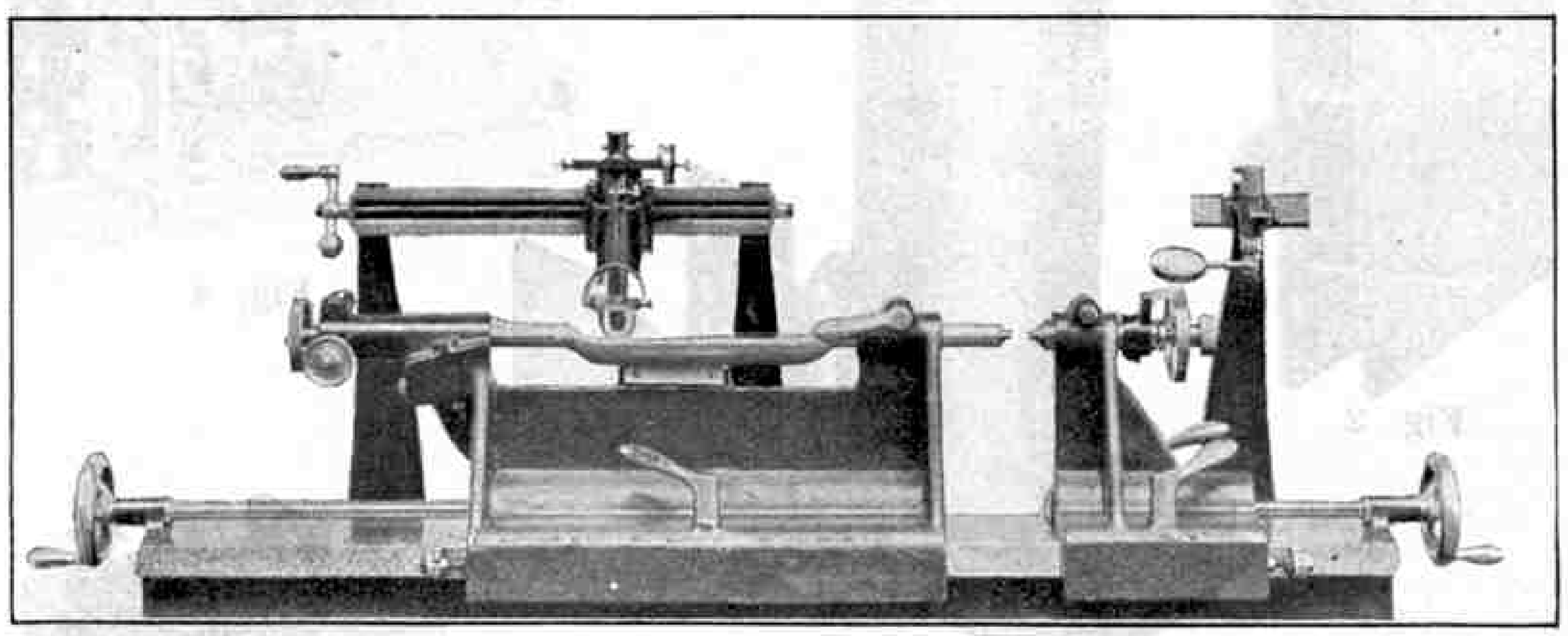


Fig. 8

A Wonderful Instrument

That Measures 1/400 Diameter of a Hair!

One of the characteristic features of modern engineering production is that of accuracy of measurement. The margin of error allowed is so extremely small that the tools employed in the various machines must be as perfect as human ingenuity can make them. The importance of ensuring that tools are absolutely right for the particular work they have to do has led to the introduction of some very wonderful measuring and testing instruments. One instrument of this kind, developed by the well-known United States firm, the Brown and Sharpe Mfg. Company, is designed to read to $\frac{1}{100,000}$ in. It seems almost incredible that such a fine degree of precision can be obtained, especially when we realise that this measurement is practically $\frac{1}{400}$ of the diameter of an average human hair!



A Wonderful Instrument that Measures to 1/100,000 in.

The instrument consists principally of a large double I-beam section, giving great rigidity and resisting any tendency of the measuring points to become deflected. The measurements are taken from a micrometer wheel, which is graduated to read to $\frac{1}{10,000}$ in.; and a vernier plate, used in connection with the wheel, makes it possible to obtain $\frac{1}{100,000}$ in. readings. In order to secure for the micrometer screw a long life of such a high degree of precision, its bearing is made practically equal in length to the length of the screw. The scale on the bar carries two lines of graduations, one of which, easily visible to the naked eye, is used to locate the scale approximately. The other graduations, which are invisible to the naked eye except under very favourable light conditions, are used for the exact reading of the scale with the help of the microscope. These graduations are extremely fine, as is also the hair line of the microscope, each being only $\frac{1}{10,000}$ in. in width. It is interesting to learn that at the other extreme the instrument can be set to measure distances as long as 16 inches.

So sensitive is this wonderful machine that, if a gauge is supported lightly between the measuring points, a finger placed on the I-beam will generate sufficient heat to make the beam expand to such an extent as to cause the gauge to drop from between the measuring points.

The Gas Engine—(*Continued from page 277*)

satisfactory arrangement, but when such a mechanism is put into practical use the valve is jerked off its seat with a sudden jolt as the point of the cam strikes the valve stem; held open for a space, and then brought with considerable force on to its seating by the pressure of the spring. The result is that the valve is noisy and needs frequent grinding and adjustment; while the stem and the cam are quickly worn away with a loss in efficiency.

After much valuable experimental work various silent valve gears have been devised. In the Paxman type a rocking cam, operated by an eccentric, is provided in place of the old type rotating cam. This arrangement is a decided improvement, and the valve is raised rapidly and gently, lowered equally rapidly, and eased gently on to its seating. The mechanism necessitates the use of a cylindrical guide, into which the valve stem is screwed. The guide is slotted, and carries a hardened steel roller at the upper end, the roller being free to rotate on a pin that extends on both sides of the cylindrical guide through slots in the valve casing. Springs are attached to the ends of the pin and hold the valve down on its seat until it is lifted by the action of a peculiar-shaped cam that is rocked up and down by an eccentric in such a manner that, on rising, it comes into rolling contact with the roller attached to the valve guide. The cam is then withdrawn and the process is reversed. The valve closes very rapidly, and the entire operation is performed with complete absence of shock or noise.

A difficulty that was experienced in the early days of internal combustion engines was the breakage of exhaust valves and the pitting of valve seatings due to corrosion caused by the hot gases that swept over them. To-day this difficulty has been largely overcome by the introduction of resistant alloys that are capable of standing up to high temperatures.

In internal combustion engines great heat is developed in the cylinders, and it is necessary for efficient working and also to prevent pre-ignition of the gas, to provide some means of rapidly cooling the cylinder walls after each explosion. Several schemes have been devised for this purpose. If a clean supply of water is available near the place where the engine is to work, no other provision is necessary, as a rule, the water merely being circulated round the hollow walls of the cylinder by a pump operated by the engine. In the case of engines up to 100 h.p. if a supply of running water is not available, it is usual to provide a water-cooling tank through which water is circulated after passing round the cylinder, so that it may cool before being used again. Where conditions prevent the use of an ordinary water cooler, mechanical coolers are used, in which a blast of cooling air is produced by means of power-driven fans.

A typical example of a powerful modern gas engine is illustrated on page 277. This engine works on the usual four-stroke principle and has four single-acting cylinders, the piston of each being connected to a separate crankshaft. The cylinder jackets are bolted to a massive iron bed that carries also the bearings for the crankshaft. The cranks are completely covered by oil splash guards and the bearings are supplied with oil by a pump that draws it from a tank situated under the bed of the engine. All the oil that runs off the bearings passes through a strainer and returns to the tank; thus the bearings receive an ample supply of oil, which is used over and over again.

The valves open directly into the cylinders, the admission valve being above and the exhaust valve below. They are of the vertical type, and the valve cage containing the admission and gas valve—which fits to the top of the cylinder with a ground metal to metal joint—can be quickly removed for inspection purposes. The exhaust valve can be readily withdrawn through the same opening.

Ignition is effected by a low-tension magneto operated by an eccentric driven from a camshaft, the timing of the spark being adjustable while the engine is working, by means of special timing gear fitted to the magneto. The ignition plug is placed directly above the centre and at the back of the combustion chamber.

The engine is started by compressed air. Special automatic gear is provided, and this is connected to two of the cylinders. It consists of a distributing valve, operated by a cam that admits compressed air to the cylinders at correct intervals. This mechanism can be instantly put into and out of operation by hand whatever the position of the crank, but if it should be left in gear after the engine has been started, no harm would be done or air wasted, as the admission of air stops as soon as the explosions commence.

The speed of the engine is controlled by a centrifugal spring-loaded governor driven by screw gear from the engine shaft. It controls the admission of gas by means of a throttle valve, and is actuated from a weigh shaft and connecting rod coupled to the governor lever.

Epic of the Frozen North—

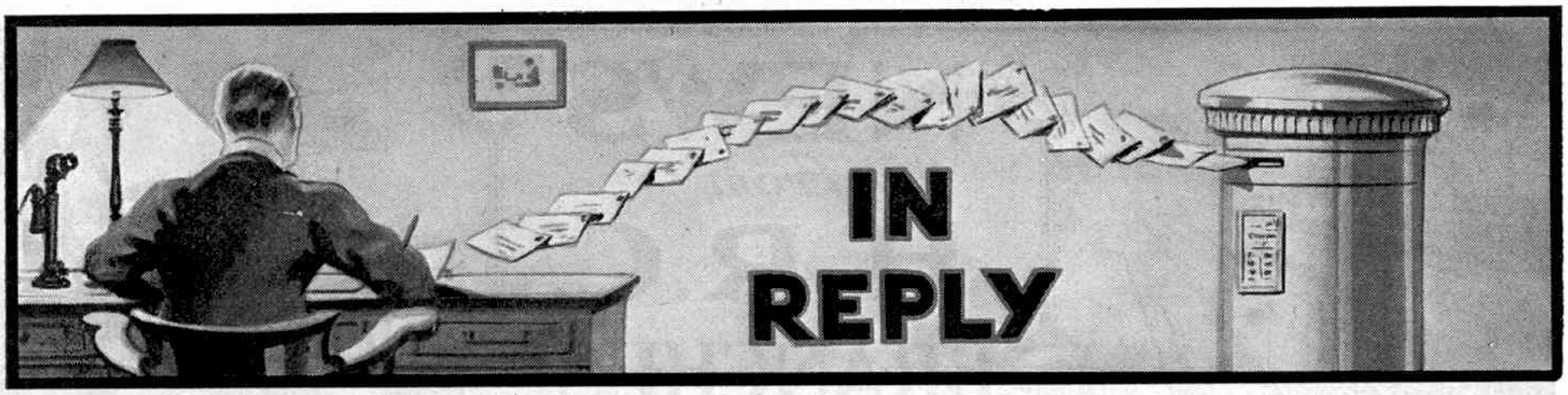
(*Continued from page 297*)

It was given a clear run, all other traffic being carefully shunted in order to make way for it.

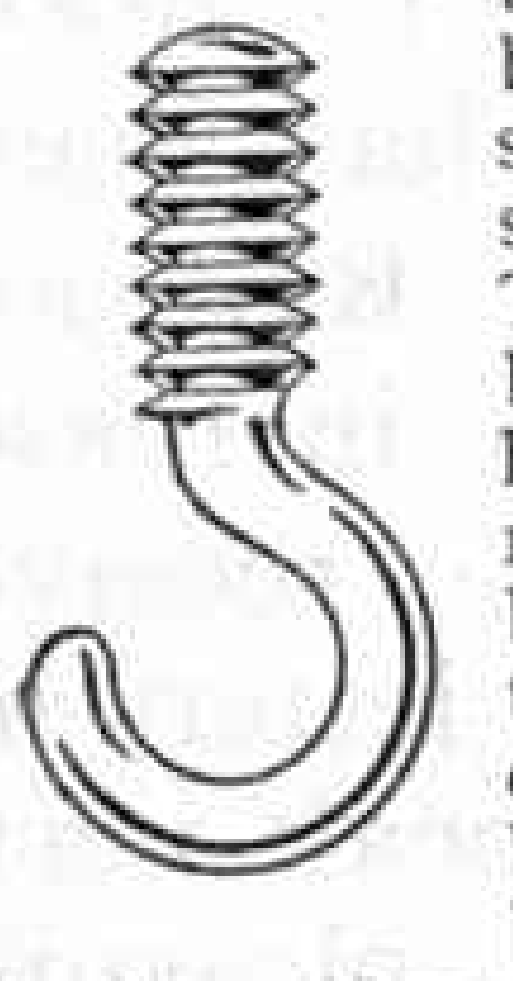
In the meantime the news of the special's mission was sent forward by wire to the hospital at Prince Albert. There preparations were made, and fifteen minutes after reaching the city the girl was on the operating table. The operation was successful and the race was won! But the margin was horribly narrow, for the surgeons stated that a further delay of only an hour would have rendered useless Johnson's heroic dash and "*Prince's*" wonderful lead.

While the train was rushing the unconscious girl to Prince Albert and the surgeons were carrying out the operation, the man who had started the work of rescue lay fast asleep on the wooden floor of the station at Big River. When he had finished his task, he was too tired to seek a bed, but simply dropped to the ground and slept.

Outside on the snow lay "*Prince*," little dreaming that his night's work would make him famous throughout Canada. To the husky it was all in the day's work—it is recorded that when the story was being told on the platform on the shore of Lake Waskesiu he merely yawned!



READERS' SUGGESTIONS FOR MECCANO IMPROVEMENTS



NEW HOOK.—We were interested in your proposed designs for a new type of hook, which you consider would form a suitable addition to the system. As will be seen from the sketch, the hook would be produced in heavy gauge wire and its straight portion, or shank, screwed with standard Meccano thread so that nuts, Threaded Bosses and other parts could be attached to it. By securing the hook to a pair of Meccano Trunnions a neat pulley block of the rigid type could be constructed, or by locking two nuts to the top of its threaded shank, the hook could be swivelled independently of the block, a function that cannot at present be reproduced with the existing Meccano hooks. From this it will be seen that the suggested part provides quite a number of possibilities and it will certainly receive attention in the future. (*Reply to R. Blandon, Leeds, and R. C. Randall, St. Albans*).

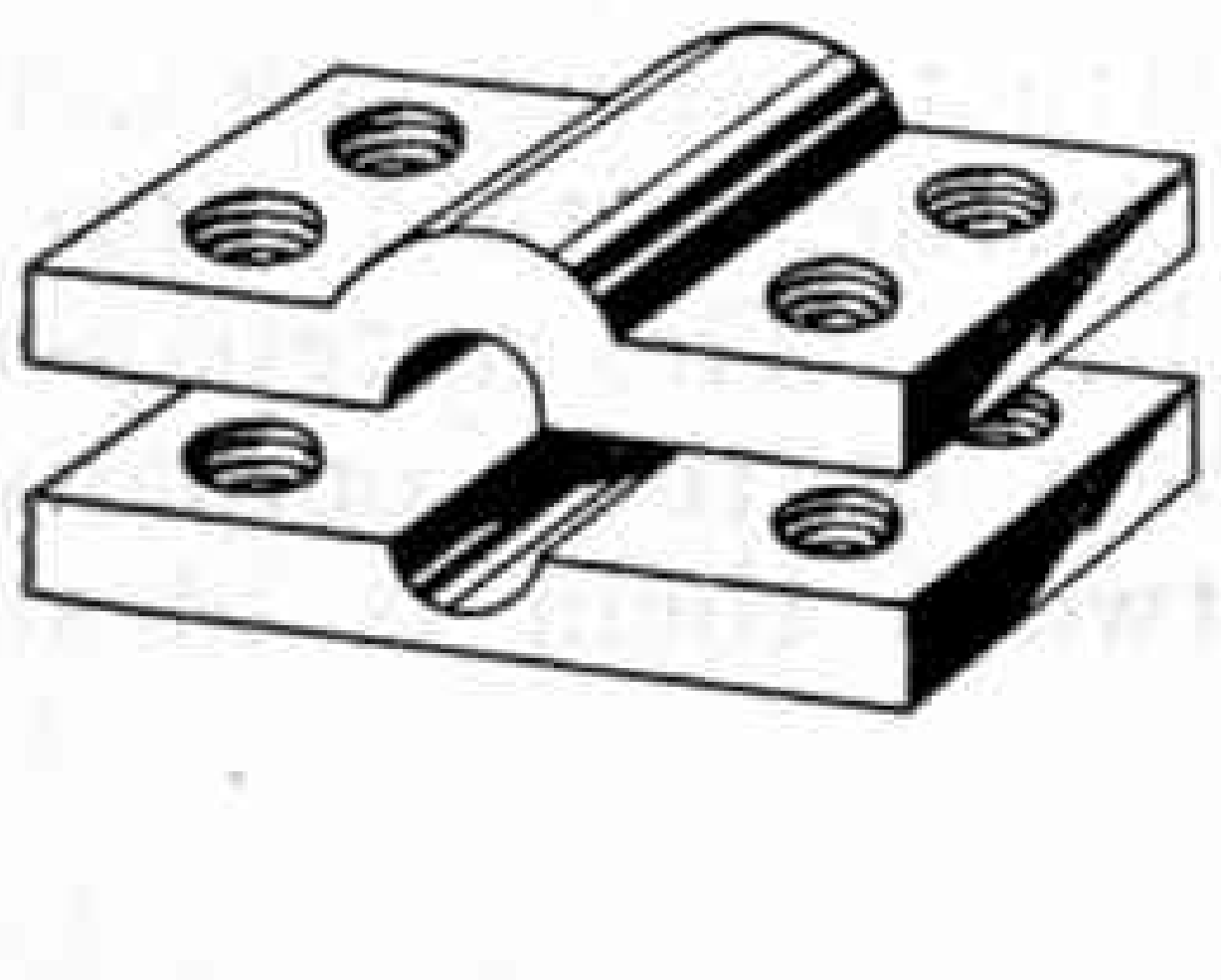
NEW TYPE BRACKET.—We were interested in your suggestion regarding a new type flat bracket in the form of a U-shaped stamping perforated with Meccano standard holes. We doubt whether many uses could be found for a part of this type but we are keeping your suggestion in mind. (*Reply to J. Villa, Barcelona, Spain*).

CHROMIUM PLATING.—We are unable to consider your idea regarding the chromium plating of Meccano parts, as the electro deposition of chromium on steel or brass is a very expensive process, and its use would necessitate an extensive increase in the price of all parts treated in this way. Chromium, we admit, gives a very pleasing and durable finish to metalwork, but while it offers many advantages over nickel and stoved finishes in motor fittings and other parts that are exposed to the weather, these would not be felt in the Meccano system. After prolonged tests we are convinced that the special enamel finish now employed is the best suited to the requirements of the system. (*Reply to N. Hulbert, Trowbridge*).

ENLARGED THREADED PIN.—In general constructional work we have found the lengths of both the threaded and plain portions of the Threaded Pin to be adequate, and we were consequently somewhat surprised to note that you advocate an enlargement of both plain and threaded parts. If other readers, whose experience has shown these alterations to be advisable, will communicate with us, we shall be pleased to go more fully into the matter. (*Reply to R. C. Clarke, Ponders End*).

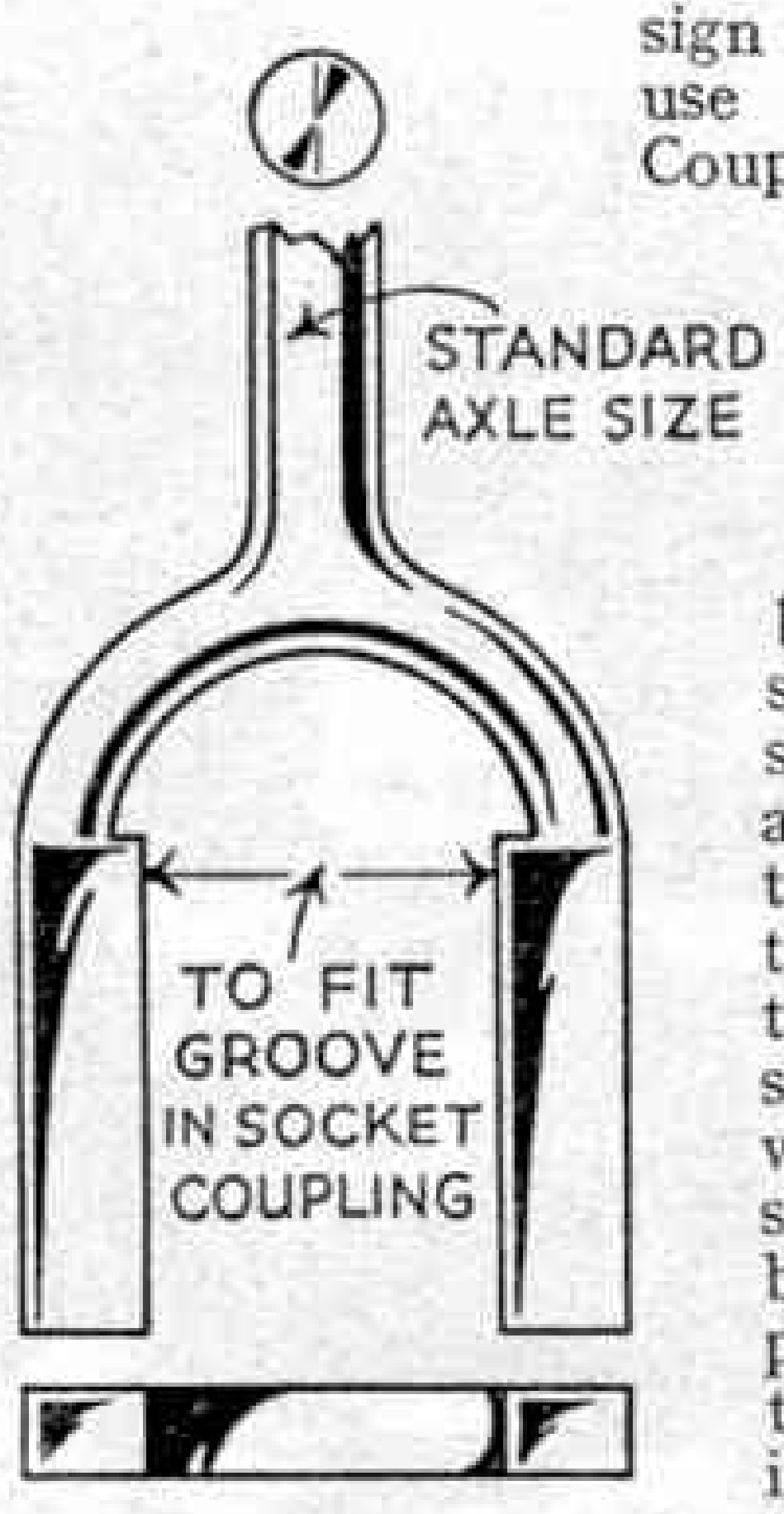
IMPROVEMENT TO SPIRIT LAMP.—Your suggested cover for the Spirit Lamp of the Meccano Steam Engine, in the form of a semi-circular sleeve that would fit over the lamp burner, would doubtless prove quite a useful "gadget," for by turning the sleeve, the wick could be completely covered and evaporation of the spirit largely prevented. We are giving this idea careful attention. (*Reply to F. H. Parks, Peacehaven*).

PLUMMER BLOCK.—We have carefully considered your proposal that a special shaft-bearing unit or "plummer block" should be introduced. The unit, as will be seen from the accompanying sketch, would consist of two small castings each having a groove of semi-circular section cut in it, so that when brought close together they would provide a bearing for a standard Rod. Each half of the bearing unit would be threaded and tapped as shown, so that they could be held together by means of standard bolts. Although the idea is quite ingenious there would be little point in our introducing a special bearing unit of this type as large reinforced bearing surfaces are never required for shafts in Meccano mechanisms. In actual engineering practice the plummer block is employed to support shafts many feet in length, and while it is of great use for this purpose, it would be more of an encumbrance than a practical unit when reproduced in miniature form. Where it is required to support long shafts in Meccano, the Handrail Support (part No. 136) will be found to suit the purpose admirably. (*Reply to F. C. Spencer, Redditch*).



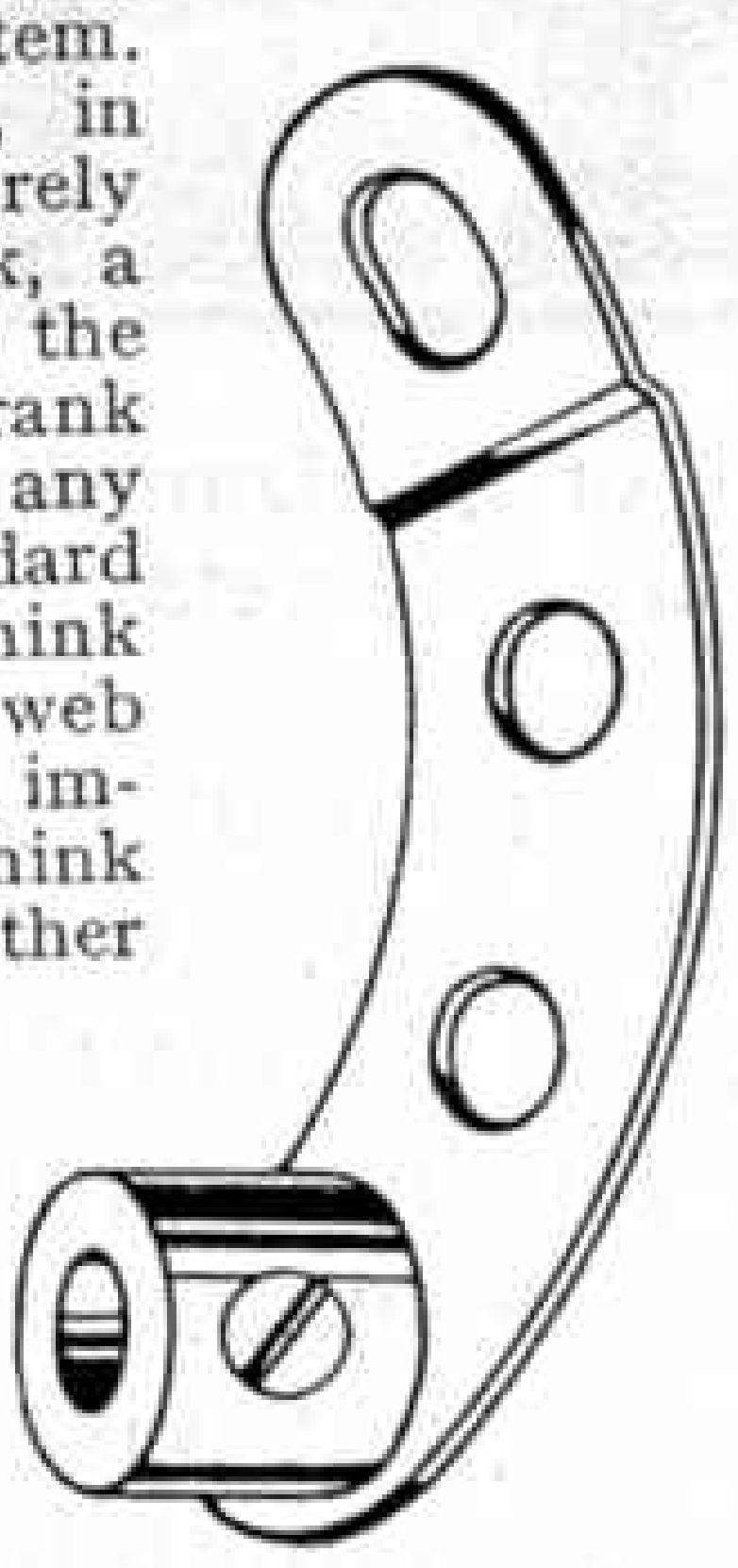
PERMANENT MAGNET.—We agree that there are one or two electrical mechanisms that can only be reproduced when a permanent magnet is employed, but we do not consider we would be justified in introducing a special magnet for use in these instances. A magnet of this type would be very expensive to manufacture, and we do not propose going any further with this idea. (*Reply to R. C. Hallam, Pinner, Middlesex*).

REVERSED PAWL.—We have inspected your design for a reversed pawl, but regret that it would not be practical to introduce this, as your proposed article would not fulfil the functions of a pawl when used in conjunction with the standard Ratchet Wheel. (*Reply to R. H. Erry, Mile End, South Australia*).



SELECTOR ARM.—Your design for a proposed selector arm for use with the Meccano Socket Coupling, has been well thought out and would no doubt be quite compact and useful. For the benefit of other readers we are illustrating herewith the essential portion of the arm, and it will be seen that the arm would consist of a rod of standard size and suitable length terminating in a forked portion, the arms of the fork being arranged so that they would fit into the groove in the Socket Coupling. The sides of the fork arms would also be machined as shown, so that the arm could be used to shift gears and pinions by actual contact with their faces. We do not intend introducing an article of this type however, as the advantages that would result from its use over a selector arm built up from Rods and Couplings, would not compensate for its high cost of manufacture. (*Reply to L. M. Noguera, Buenos Aires*).

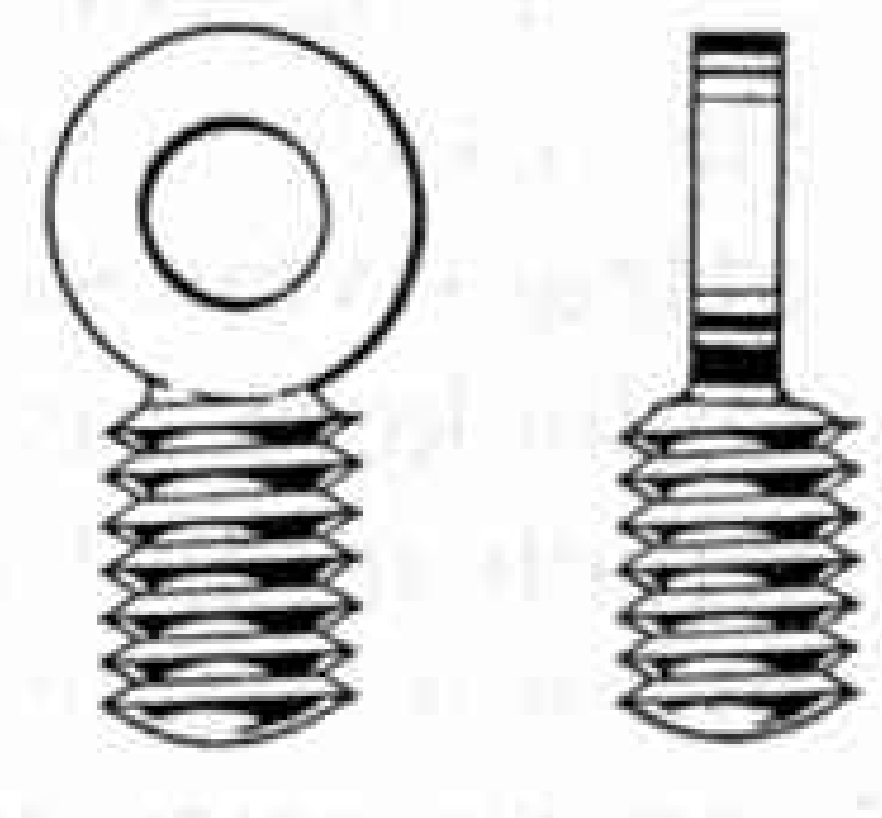
CURVED CRANK.—We fail to see that a crank formed by attaching a boss to a Curved Strip as shown in the accompanying sketch, would be of any use in the Meccano system. The uses of curved strips, etc., in Meccano are confined almost entirely to structural or ornamental work, a branch of construction into which the crank never enters, and a curved crank would not consequently possess any advantages over the existing standard pattern. We likewise do not think that to "crank" the end of the web of this part would constitute an improvement, and are inclined to think that this would tend to hinder rather than increase the uses to which the part could be put. Perhaps, however, you have some special use for your suggested part in mind, in which case we shall be pleased to hear from you again. (*Reply to R. J. Sutton, London, S.W.17*).



IMPROVED MOTOR WINDING SPINDLE.—We note you suggest that the winding shaft of the Clockwork Motor should be enlarged so that it might be turned by means of a standard Spanner, but we do not think that the advantages resulting from this would be worth the trouble of alteration. Even if it were possible to turn the shaft with a Spanner, a special winding key would still be required, as the Spanner is not really suited for this purpose, and would tend to slip off during rotation. If alterations to the winding spindle are made we are inclined to favour the threading of the winding shaft with standard Meccano thread, as in modern gramophone motor practice. We hope to say something more about this in the near future. (*Reply to E. H. Hampton, Prestbury*).

BASE BOARDS.—Model-builders are generally able to obtain suitable baseboards for large models locally, and we do not think it necessary to supply special boards for this purpose. *Reply to V. H. Goodhew, Hanwell*).

EYE-BOLT.—Your suggested part, which in engineering is known as an "eye-bolt," would have a very limited application in Meccano. The accompanying sketch will give readers an idea of the appearance of the bolt, and from this it will be seen that it would resemble a standard bolt having its head formed into the shape of a washer. The eye-bolt is used in practice to anchor chains, hooks, and the ends of wire ropes, and your suggested part could doubtless be used to some extent for similar purposes in Meccano construction, but owing to the fact that the perforations in the Meccano parts nearly always provide a convenient point to which a cord, chain, or hook may be attached, there are few instances where your suggested part would be of real value and even when these instances occur you could use a Meccano Handrail Support, which will be found to form an efficient substitute. (*Reply to S. Kilburn, Nottingham, and J. M. Beaumont, San Andres*).

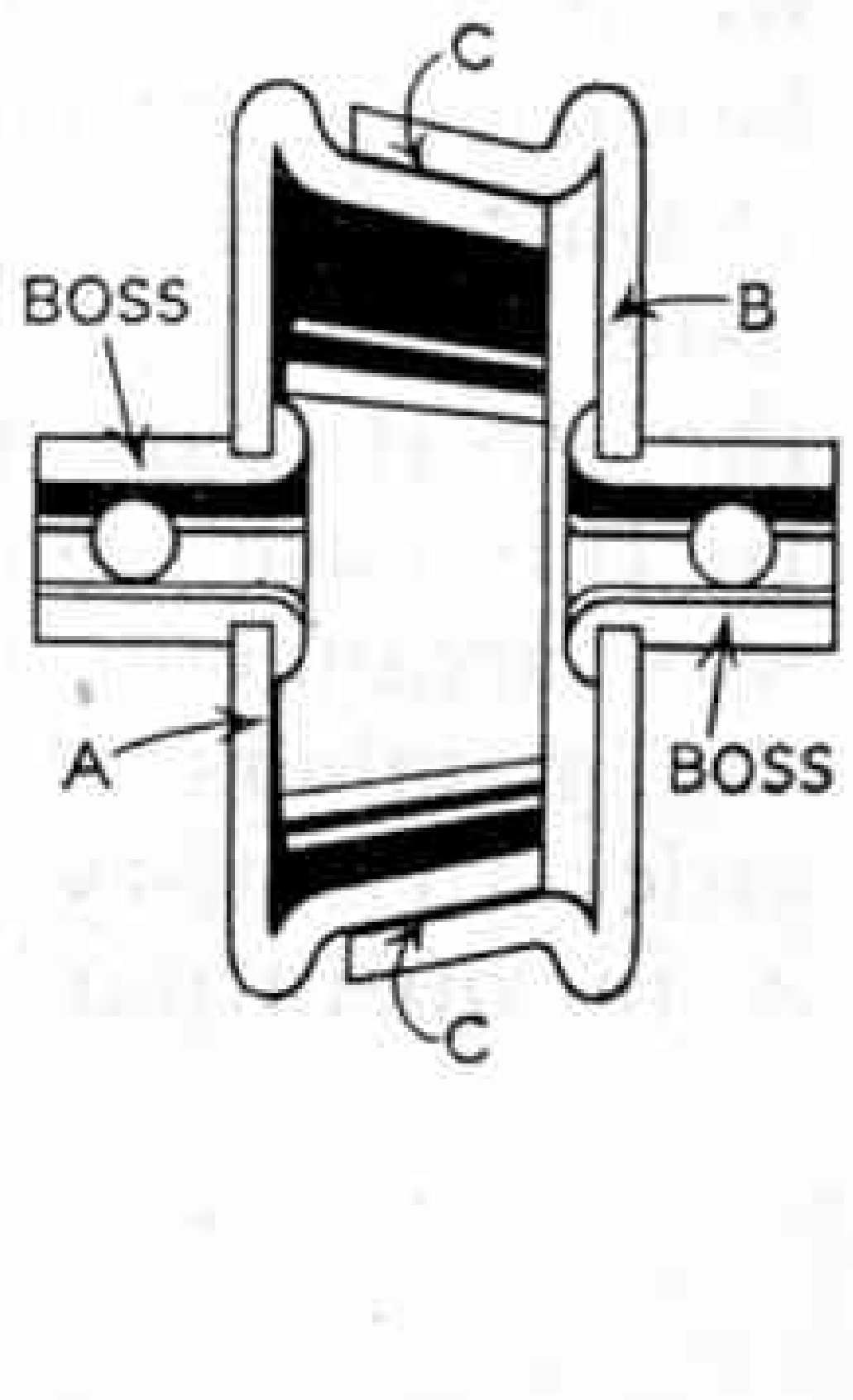


IMPROVED FORK PIECE.—Your proposal that the lugs of the Large Fork Piece (part No. 116) should be extended is quite a good idea. We agree that in its present form (i.e. with one-hole lugs) it is impossible to secure Strips or other parts to it with the maximum degree of rigidity and, if the lugs were extended and two perforations drilled in each, this difficulty would be overcome. The only drawback would be that the increased size of the lugs might obstruct operation in certain models, but we hope to test this idea from a practical standpoint, and will comment further on it in the future. (*Reply to R. Fletcher, Leyton, E.10*).

IMPROVED FAN.—To cut a groove in the boss of the Meccano Fan would certainly tend to increase compactness in construction. At present when it is required to drive the Fan by means of cord and Pulleys it is necessary to mount a fast Pulley on the same shaft as the Fan and as the latter has often to be used in confined spaces (as in the Motor Chassis) this results in a somewhat clumsy and inconvenient unit. To form the Pulley and Fan in one piece in the manner mentioned above, would overcome this trouble and we are giving the idea attention. (*Reply to E. R. Webb, London*).

WOODEN PARTS.—We cannot consider introducing perforated wooden strips, plates, etc., as these would have a markedly detrimental effect on the complete system. In questions of strength and appearance, metal possesses unquestionable advantages over wood, and we have consequently excluded the latter material entirely from the structural section of the system. (*Reply to R. Martin, Southampton*).

CONE CLUTCH.—Although the built-up friction clutch described in the Standard Mechanism Manual (see S.M. 61) is quite efficient in operation, we agree that a clutch built exactly like the actual units, would be even more effective, and we therefore studied your design for a cone friction clutch with interest, and as this idea will doubtless be of interest to readers, we illustrate it herewith. The complete unit would comprise two discs, A and B, having conically shaped flanges of such a size that one would form a tight fit in the other when fully engaged. The internal and external surfaces C, which are in contact with each other, would be roughened or milled so as to provide a good grip. Each disc would be fitted with a standard boss and set screw, so that it could be locked to its respective portion of the transmission shafting in a model motor car or other mechanism. The design appears to be quite sound although it might be advisable to cut a groove in one of the bosses so that the operating mechanism could be coupled to it. From a superficial examination of this idea, we cannot of course pronounce a definite opinion on its practicability, but we hope to give it close attention in the near future. (*Reply to Collis Hocker, Christchurch, N.Z.*)



NEWS *from* H.R.C. BRANCHES

Fascination of Model Railway Displays

During the past month I have noted in reports from the Branches two striking illustrations of the wonderful attractiveness of a well-run Hornby Train layout. Onlookers invariably are fascinated by the manner in which miniature trains may be kept running in realistic fashion according to a pre-arranged timetable, and eagerly seize any opportunity that may be given them of witnessing a display of this kind. The officials of every Branch, therefore, should have no hesitation in arranging to hold an Exhibition to wind up the session, or at some other suitable time, for this will not only help to make the Branch known, but also will increase its popularity in the neighbourhood.

Cheery members of the Dunedin (New Zealand) Branch, No. 72 ; Chairman, Mrs. MacLachlan ; Secretary, T. MacLachlan, who is nursing the mascot.

Members of the Hendon Branch have proved the truth of this by an Exhibition recently held at which they operated a model railway layout 28 ft. in length. This was not particularly elaborate ; in fact, it was only an oval with a loop line branching off at the side, the loop line having five sidings that included one with a turntable. The attractiveness of the display lay in the manner in which it was worked. Everything was carefully arranged beforehand and a well-organised timetable was gone through, trains being despatched at intervals of two minutes, with the result that visitors obtained a very favourable impression of the capabilities of the members.

An even more striking instance was provided by the wonderfully successful Exhibition held by the Newcastle Branch in conjunction with the Newcastle Meccano Club. Details of this event appear on the Guild pages of this issue of the *"M.M.,"* and here I only wish to point out the great part played by the Hornby Train layout. In this case also a complete programme of operations was arranged, and the layout was so popular that the members of the Branch had to work overtime in order to satisfy the demands made by visitors to see it in operation !

The Correspondence Club

For the benefit of new members I wish to draw attention to the Correspondence Club that has been organised in connection with the Hornby Railway Company. Membership of this continues to increase steadily and recently I have been gratified to receive from many of those who have joined it cheery letters in which they speak very highly of the pleasure they obtain from the exchange of railway news and photographs with friends of similar interests abroad.

The advantages of the Correspondence Club are open to every member of the H.R.C. without payment of any kind. At the present moment correspondents in France and Canada are chiefly in demand and any member of the H.R.C. living in one of these countries who has not yet joined the Club should immediately send in his enrolment form, duly filled up. Those not in possession of the necessary form should write to headquarters for one. In order to assist the staff and to avoid unnecessary delay, it is advisable that alternative countries in addition to the one in which a correspondent is chiefly desired should be given on the form.

Notepaper for Members of H.R.C.

In view of the many enquiries that have reached me regarding notepaper specially adapted for use of the members of the Company the appearance of H.R.C. writing pads will be very gratifying. These are available in two sizes, each containing 50 sheets, at 6d. and 1/- each post free, and may be obtained direct from Headquarters by forwarding the necessary remittance in the form of stamps.

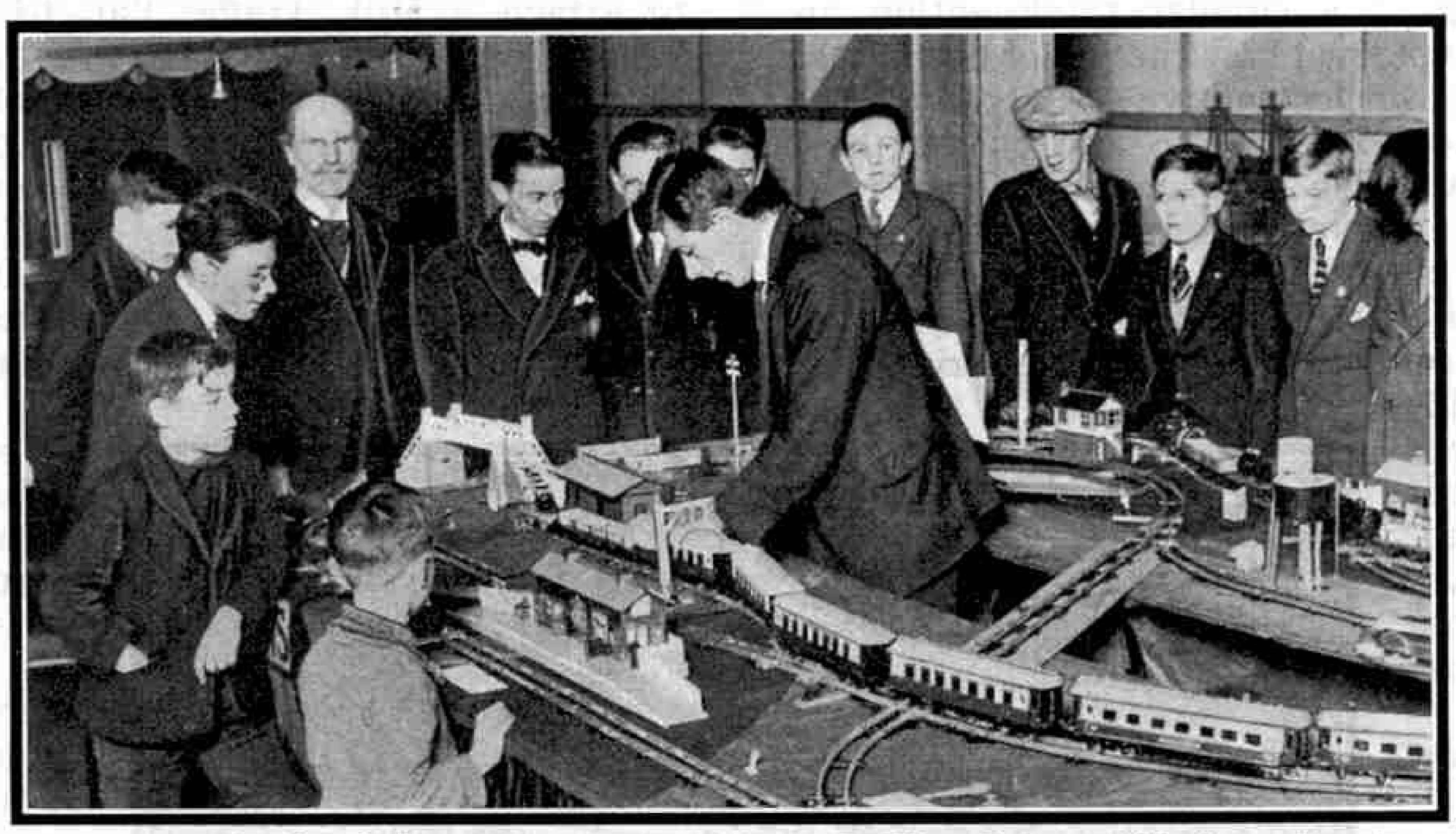
At the head of every sheet is an attractive reproduction of an express train at full speed, together with a representation of the badge of the H.R.C. The notepaper is intended for the use of members of the Company only, and for correspondence between them is ideal.

Branch Notes

"Ashleigh" (Bexley).—Members paid a very enjoyable visit to the Schoolboy's Exhibition in London. Great interest was shown in the many fascinating exhibits. Experiments have been made to decide whether a continuous or non-continuous type of layout was best for handling a large amount of traffic. It was decided that a non-continuous type was better, provided that a long enough run could be obtained. Secretary: A. F. C. Harmer, "Ashleigh," Manor Way, Bexley, Kent.

Hendon.—The 2nd Annual Party was held at the Hendon Town Hall. About 100 guests were invited. A fancy dress parade took place and prizes were awarded for the most original costumes. After an excellent tea, prizes were presented by Mr. Ramsay, A.M.I.E.E. Materials have been purchased to improve the permanent track and the work is being carried out by the members, who have adopted the "gang" system. Secretary: A. Needell, 1, Sunningfields Crescent, Hendon, London, N.W.4.

Dorchester.—The Branch track runs from "Dorchester" to "Weymouth" with Branch lines to "Portland" and "Abbotsbury." Timetable working is a regular feature of the Branch and some realistic shunting work is done at "Portland," where miniature slabs of Portland stone are loaded into trucks ready to be carried to other towns on the line. Secretary: J. Rogers, 10, High East Street, Dorchester.



Members and visitors keenly interested in the operation by Mr. B. Gilbey, Chairman of the Newcastle-on-Tyne Branch, No. 33, of the Hornby Train layout on view at the Branch's successful Exhibition. For this photograph we are indebted to the "Newcastle Evening Chronicle."

Newcastle-upon-Tyne.—In conjunction with the Newcastle Meccano Club an Exhibition on a very large scale has been held. A large miniature railway layout attracted a great deal of interest and attention. The Exhibition was opened by the Deputy Lord Mayor and was open for four days. This was an outstanding success and attracted 10,000 visitors. A birthday party has also been held which was very much enjoyed by the members. An interesting visit has been paid to the Gateshead Locomotive Sheds, and several other visits of railway interest have been arranged. Secretary: Kenneth Mark, 445, Chillingham Road, Heaton, Newcastle-on-Tyne.

Kensington.—A very interesting visit was paid to Charing Cross Underground Station to view the model railway on which the working of trains is demonstrated. In trackwork members are allotted part of the Branch layout to superintend and each is responsible for all trains as they pass through. As the present club room is rather inconvenient the Secretary would welcome any information in regard to one that is more suitable. Secretary: D. J. Higgens, 28, Hillersdon Avenue, Barnes, London, S.W.13.

Woodford.—The Branch has now been divided into rival sections, and marks given for good work are compared at the end of each month. Football matches are very popular and a very successful cross country run has been held. A large shed which houses the Branch track during the summer months is being prepared ready for the summer session. A track making competition is to be held and the layout to be adopted for the summer months will be based on the winning design. Secretary: J. H. Skelt, "Walberswick," Woodside Road, Woodford Wells, Essex.

Nottingham.—Fretwork nights have become a regular feature and during these models are made for use in connection with the Branch layout. The Branch track has been modelled on that which appears in the Senior Section booklet, page 13, and it is successfully operated to timetable. Secretary: W. G. Brown, "Mayoniss," Dale View Road, Sneinton Hill, Nottingham.

First Alva.—Extensive preparations are being made for an Exhibition. Scenery is being prepared and Meccano models are being built. Many interesting visits have been arranged including a visit to the Alloa Glass Factory and Paper Works. Secretary: Wm. McArthur, 72, Queen Street, Alva.

Portslade-by-Sea.—The Branch track has now been laid on shelving and scenic accessories are being added. A great loss has been sustained in the death of Jack Burns, one of the keenest members. Secretary: J. Flowers, 38, St. Aubyns Road, Portslade.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership, and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

Acomb—K. Shannon, 38, Severus Avenue, Acomb, York.
Aveley—R. Clark, The Lodge, Mill Road, Aveley, Essex.
Chertsey—E. V. A. Brown, Arbon Grove Cottage, Lyne, Chertsey.
Cirencester—H. Stukley-Barker, c/o Miss Fryer, The Avenue, Cirencester.
Epsom—J. F. Long, "Shirley," Kingsdown Road, Epsom.
Glossop—W. Oliver, Rose Villa, North Road, Glossop.
Hastings—S. Heyburn, "Redcot," Linton Road, Hastings.
Leicester—R. G. Monk, 100, Westcotes Drive, Leicester.
Leigh-on-Sea—M. McAteer, "Buona Vista," Marine Parade, Leigh-on-Sea.
London, E.4.—H. E. Jones, 167, Winchester Road, Highams Park, Chingford.
Lydd—F. Nicholson, Gas House, Station Road, Lydd, Kent.
Plymouth—W. A. Harris, 9, Baring Street, Plymouth.
Reading—S. G. Burley, 12, Gloucester Road, Reading.
Richmond—P. Grant, 20, Park Road, Richmond.
Romford—L. Haylor, 86, Mildmay Road, Romford, Essex.
Salford—J. Adderley, 50, North George Street, Salford.
Shortlands—H. F. Starling, 110, Farnaby Road, Shortlands, Kent.
Southall—J. Eggleston, 5, Meadow Road, Southall, Middlesex.
Stamford—E. J. Belton, 43, Casterton Road, Stamford, Lincs.
West Kirby—C. R. Woodward, The Spinney, Grange, West Kirby.
Winchester—E. Chalkley, 78, Hatherley Road, Winchester, Hants.
Wolverhampton—R. Wooddissee, 80, Bamford Road, Wolverhampton.
Wroughton—G. Reynolds, 10, Winifred Terrace, Swindon Rd., Wroughton, Wilts.
Wylde Green—E. J. Newton, Wych Elm, Wylde Green, Nr. Birmingham.

OVERSEAS

Egypt—W. D. Draycott, c/o P.O. Box 278, Alexandria, Egypt.
New Zealand—P. Brathwaite, 607, York Street, Hastings, Hawke's Bay, N.Z.

Further H.R.C. Incorporated Branches

102. St. Ebba (Ebchester)—I. Bewley, Chelmsford Hotel, Ebchester, Co. Durham.
103. Medina (Isle of Wight)—A. G. Odell, "Ellesmere," Carisbrooke Road, Newport, I.O.W.
104. St. Agnes' Church (Hove)—R. Jenkins, 8, Frith Road, Hove.
105. Notting Hill—Mrs. Sharp, 132, Cornwall Road, Notting Hill, London, W.11.
106. Sligo—K. McMenamin, 78, John Street, Sligo, Ireland.
107. First Cardiff—A. V. Strong, 24, City Road, Cardiff.
108. Woodroughs School (Moseley)—R. S. Smith, 72, Alcester Rd., Moseley, Birmingham.
109. Haroldwood—C. L. Barber, "Beaurains," Church Road, Haroldwood.
110. King's Norton—P. L. Hughes, "Merrie Meade," West Hill Road, King's Norton, Birmingham.

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

Hornby Railway Company

JUNIOR SECTION

XVI.—Trackwork on a Simple Layout

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

LAST month we described the building up of a simple layout consisting of a circular track within an oval. We also explained how the junior enthusiast should experiment with his locomotive—a Hornby No. 1 Special in this instance—in order to find exactly how many turns of the winding key should be given in order to enable it to make runs of various lengths.

A youthful engineer shows how Meccano may be used to improve a Hornby Train layout. An express train crossing a gully on a bridge constructed from Meccano parts.

By carrying out trials of this kind the owner of a Hornby miniature railway places himself in a position to get the best fun from the use of his material. To begin with, he will probably be satisfied to run his train round the oval track, or to despatch it on journeys that include both the oval and the circular tracks of the layout.

These, of course, are simple operations but they may be made exceedingly interesting by carrying them out in workmanlike style. For example, if the train is to be run as an express, the lamps provided on the locomotive should first be placed on the brackets at the end of the buffer beam, this being the correct railway position for trains of this character. As the locomotive stands in the station, the motor is then wound up sufficiently to enable it to make the required number of circuits of the track and to come to a stop on arriving at the station. On releasing the brake the train moves out of the station and quickly gathers speed. Its run is watched with increasing excitement, which is followed by a feeling of satisfaction when it comes to rest exactly as intended.

The train also should be run as a slow train stopping at intermediate points. It is a little unusual for such trains to be composed of Pullman coaches, of course, and to be strictly accurate, ordinary passenger stock should be used.

If several circuits of the track are regarded as a full express journey, the slow train may stop when it comes round to the point on the track where the station is situated. It is not altogether satisfactory to have the train stop at the same station every time, however, and operations will be more realistic if at least one additional stopping place is included. For this an elaborate station is not necessary and it is a good plan to make it a wayside country halt, where full milk cans are picked up or empty ones put off. In real railway practice slow passenger trains frequently carry such traffic, and therefore it is quite in order to attach a Milk Traffic Van to our stopping train. When changing the character of the train, care should be taken to alter the positions of the lamps on the brackets at the front of the locomotive, a stopping train being indicated by the use of a single lamp at the base of the chimney.

In operations on a simple track really good fun may be obtained by alternating express passenger trains with stopping trains in the manner suggested. A good wind-up to such a series is the running of an empty coach train. The coaches may be hauled round the oval track as many times as desired and finally run into the inner circular portion, to be left there until again required for service. On this last run of the day the locomotive should carry one lamp at the base of the chimney and one above the right hand buffer, this being the headlamp code indication that is always used for a train of empty coaches.

The inclusion of milk traffic on our miniature railway is a reminder that real railways exist for the transport of goods as well as for the carriage of passengers. Although a model railway on which passenger trains only are run is quite interesting, it leaves something to be desired, and the junior enthusiast who adds goods wagons to his stock of railway material will feel that his operations have a greater resemblance to real railway work.

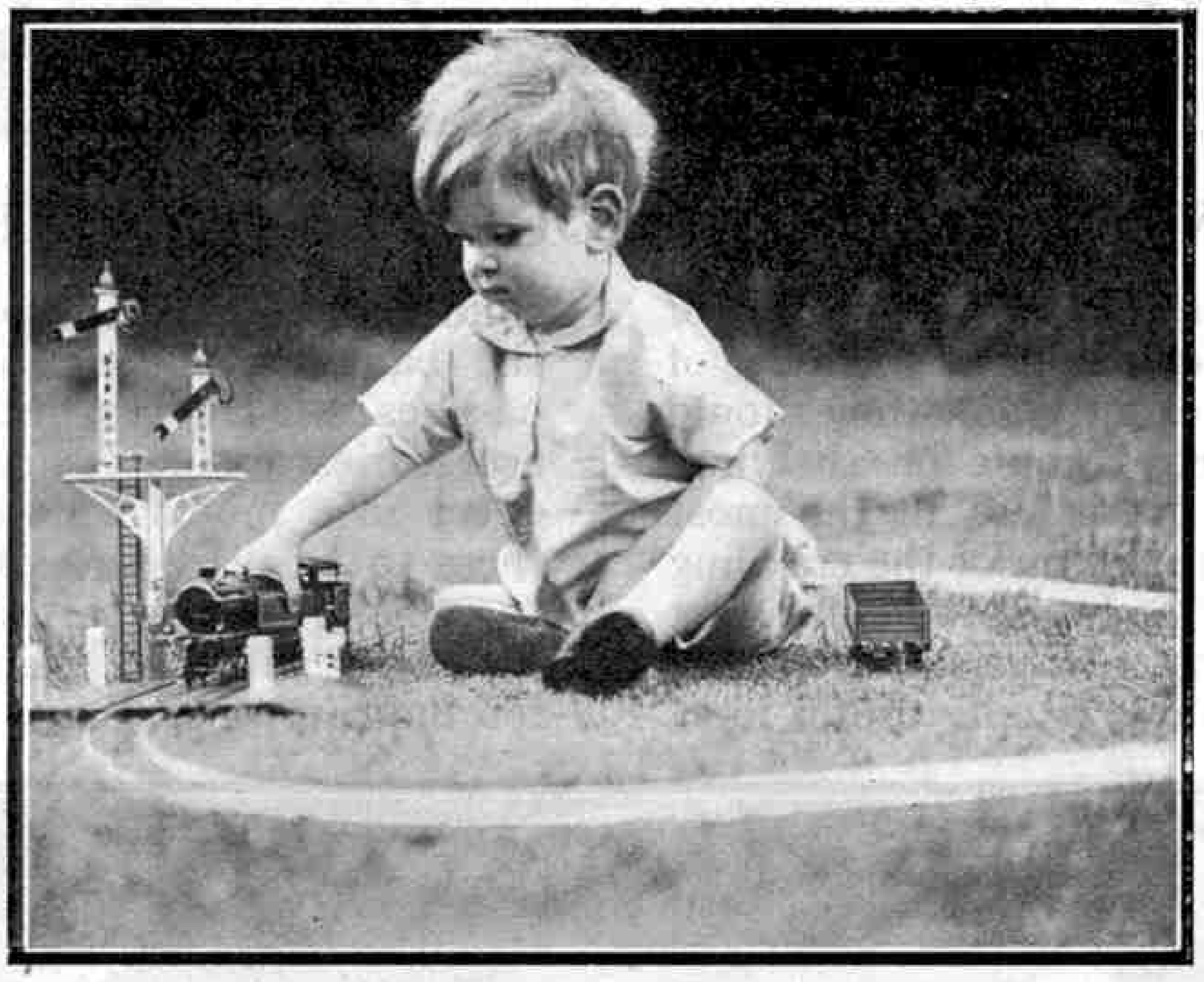
A large variety of goods wagons are available in the Hornby System, but the beginner will be well advised to confine his attention to open wagons, and the No. 1 and No. 2 Luggage Vans. With the addition of a Brake Van the possession of a few of these will enable him to form a goods train very similar in appearance to the majority of those to be seen on railway tracks.

The Hornby No. 1 Special Locomotive that we suppose is being used on the layout we are developing is quite suitable for hauling goods trains. It is an ideal mixed traffic or general purpose locomotive, occupying in the Hornby System the position held on real railways by engines of 2–6–0 type.

The acquisition of the rolling stock required for the composition of a goods train enables us to run three types. Greater variety is thus obtained and this brings with it more fun and increased interest.

The keen model railway enthusiast who has progressed so far in the development of his layout now will find that a siding is desirable. Otherwise the idle train—or trains, if passenger stock is used in addition to Pullman coaches—must be shunted into the circular track, where it occupies a portion of the layout over which we desire to work.

In order to avoid wasting material by using running track as a siding, a suitable place for a few straight rails should be found and these should be connected to the layout. An excellent place to put a siding is parallel to one of the lengths of straight track that help to make up the oval track. The last curved rail on the approach to the straight section selected should be replaced by a left or right hand point, as the case may be, when it will be found that the straight rail of the point will lead away from the main track. The curved rail removed should be placed at the end of this and the addition of a few lengths of straight rail will then give a siding in the position required.

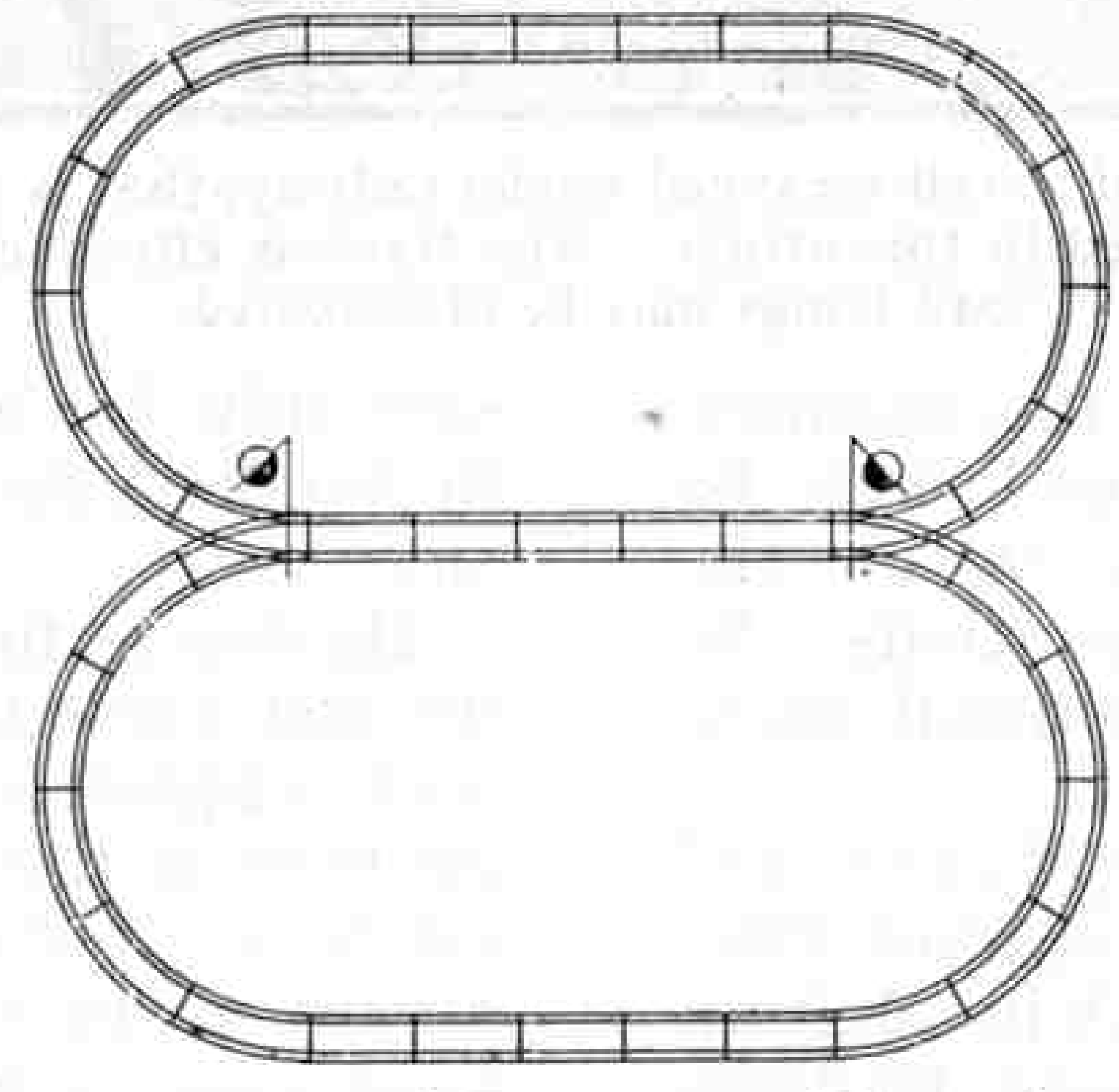


Railway work demands care and concentration! This is appreciated by the junior engine driver who in our photograph is shown preparing his Hornby No. 2 Tank Locomotive for a long run on his outdoor layout.

After making provision in this manner for the disposal of rolling stock not actually in use, we may make useful variations in track work. There are several routes that may be followed. For instance, trains may be run continuously round the two tracks in succession, or they may be allowed to travel round the oval several times before being switched on to the circular portion. Similar operations also may be carried out on the extended track shown in this month's "Suggested Layout." This and similar formations are quite easily developed from the simple track shown last month.

Whatever form of layout is employed stopping places may be arranged on straight sections of the line. If there are three of these, as on the "Suggested Layout" illustrated, we shall then be able to start the run of a train from a central station, take it round one oval to a second station and back to its starting point. The continuation of this journey would then take the train to the third station and back again.

On one section of the run, the stop at the central station may be omitted, while those who do not wish to make use of so many stopping places may reduce the number to two, the stations being placed on the outer straight sections. It is when carrying out operations of this kind that a knowledge of the powers of the locomotives employed is most useful, for the motor may be given the exact number of turns required to enable it to complete a run of any length that may be planned.



Suggested Layouts (No. 9)

2′ **Radius** (as illustrated): 20 Curves, 15 Straights, R.H. Double Symmetrical Points, L.H. Double Symmetrical Points.
1′ **Radius:** 8 Curves, 12 Straights, R.H. Double Symmetrical Points, L.H. Double Symmetrical Points.

Further additions to the miniature railway now developed may be of two kinds—locomotives and rolling stock, or rails and accessories for the track itself. The choice of these depends entirely on the owner, but there is little doubt that eventually he will develop in both directions. To begin with, he may endeavour to include a few accessories. These do much to increase the realism of the layout. For instance, a railway without bridges is almost unthinkable. A deficiency in this respect may be remedied by the use of the Hornby Lattice Girder Bridge or Foot Bridge, and handsome structures of various types also may easily be constructed from Meccano parts. These are very effective when made to span actual gaps, particularly when the railway is operated out of doors.

Another addition, and one that has a very picturesque appearance, is a Hornby Level Crossing. This gives a very pleasant effect when placed near a station, as so often is the case on real railways. It is provided with an extra half rail, and as its own length is equal to this, it may readily be incorporated in place of a straight rail in any section of the layout.

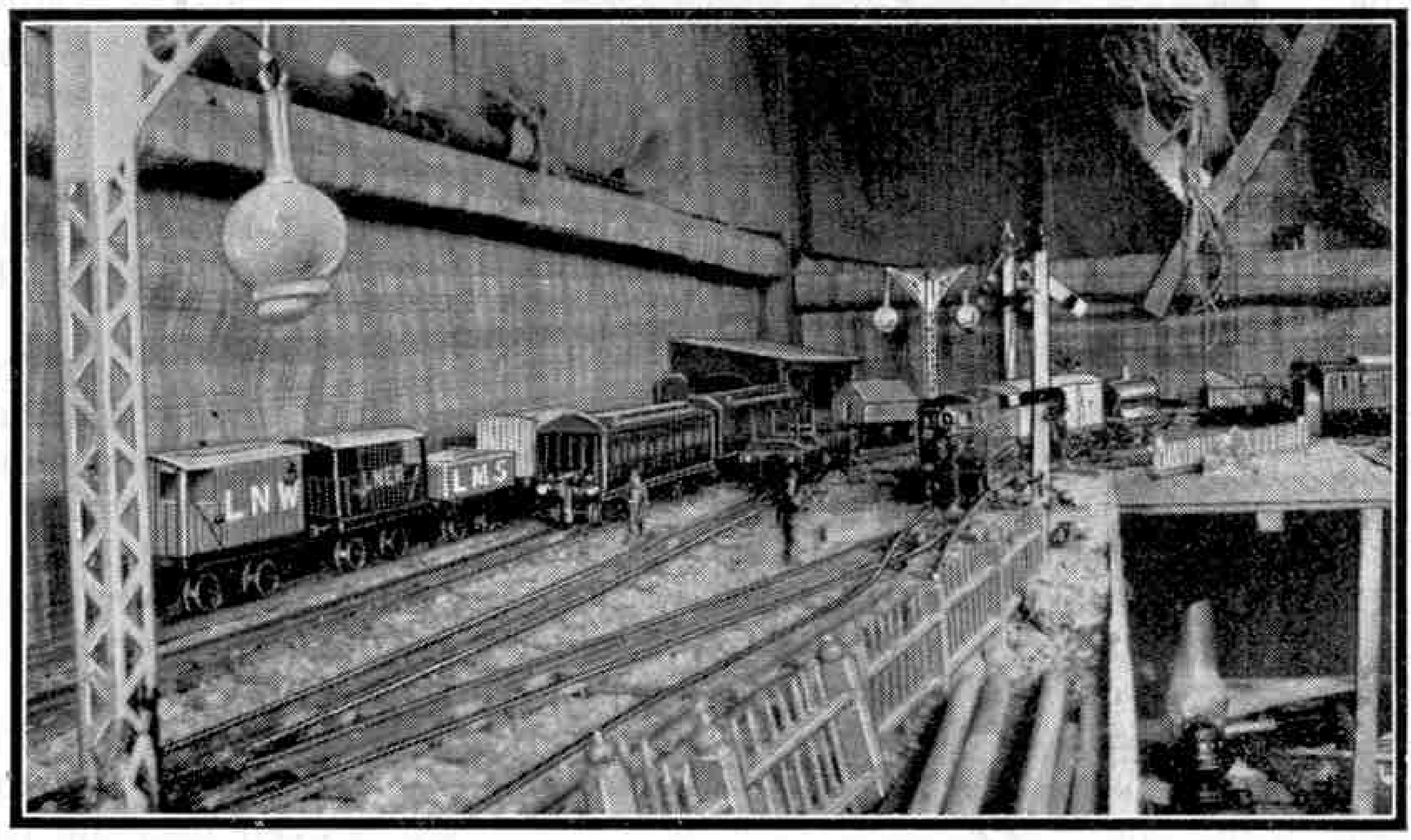
A useful accessory that makes a great improvement is a Signal Box, and a station layout that includes one of these and the usual signals in addition to the Level Crossing may be made a very faithful reproduction of the real thing.

The second direction in which operations may be extended is the provision of more locomotives and rolling stock. Another engine is particularly useful, for with its aid passenger and goods trains may be run independently. They even may be run simultaneously, and many interesting situations then develop. For instance, let us suppose that two trains, one on each of the ovals of the "Suggested Layout" illustrated on this page, are approaching the same double symmetrical point in a trailing direction. If left alone they will collide. One train therefore must be stopped in order to allow the other to precede it along the length of single track common to the two ovals. As the train that is allowed to proceed approaches the facing point at the end of the single line, this may be set to switch it on to the oval on which the first train is being held. Then the second train may be restarted. Following the first down the single line, it is diverted to the second oval by quick manipulation of the points. The first train may be stopped at the station on the outer line, while the second train is run non-stop for a time. Both may then call at the central station in turn, and any other equally interesting variations may be introduced.

How to get more fun from your Hornby Railway

XVIII.—HOW TO MAKE A MODEL RAILWAY BASEBOARD

DURING the past few months a very large number of requests have been received from owners of Hornby Trains to explain exactly how they should proceed in order to mount their layouts on shelving. Their purpose is to carry out operations in the most convenient manner and with a minimum of the crawling on the floor that occasionally is the lot of the enthusiast whose layout has grown too large to be accommodated on an ordinary table. Such a table is only useful for a comparatively small oval track and the model railway enthusiast will be well advised to construct a baseboard suitable for the size and shape of his layout, and to support this at a reasonable height. A surprising increase in the amount of pleasure derived from his miniature railway will be his reward for any trouble that this may involve.


The station and yard of a well arranged model railway, that is carried upon trestles in the manner described in this article. The track is effectively ballasted and the yard lamps may be illuminated.

If possible the track should be planned to follow the walls of the room in which it is built, for the longest run in the space available is obtained in this manner. Where this cannot be done the baseboard may be constructed with an open centre inside which the owner may stand when conducting operations. In each case no particularly difficult constructional problems arise.

The first point to be decided is the width of the board along which the track is to run. In settling this, allowance should be made for an extra track in addition to the main line and care should be taken to have sufficient space on which to put sidings and stations. In many excellent layouts these, together with engine sheds and goods yards, occupy the corners, where they often fill up awkward spaces in a very effective manner. But this is not invariably the case and when they are placed in other positions the baseboard at these points should be roomy enough to enable them to be placed correctly.

Scenic effects and the space they occupy also must be considered. For instance, if the line is to pass through a deep cutting before plunging into the depths of a model tunnel, a position in which to place the material forming the banks must be provided for when planning the baseboard. Hedges, retaining walls, railings and other accessories are necessary to give a completely realistic effect to a model railway, and if space is not left for these to be placed on the layout in a natural manner the line will have a cramped appearance that to the onlooker will be painfully suggestive of lack of forethought in planning the model railway.

After taking these factors into consideration it probably will be found that the width of baseboard required to carry double track main line is about 1 ft. 6 in. Where stations, with their adjacent sidings and yards, are situated, a width of about three feet usually is suitable. Every effort should be made to provide as much room as possible, but excessive width should be avoided, particularly if the layout is to be operated from one side only, for in that case difficulty will be experienced in handling locomotives or rolling stock on its further side.

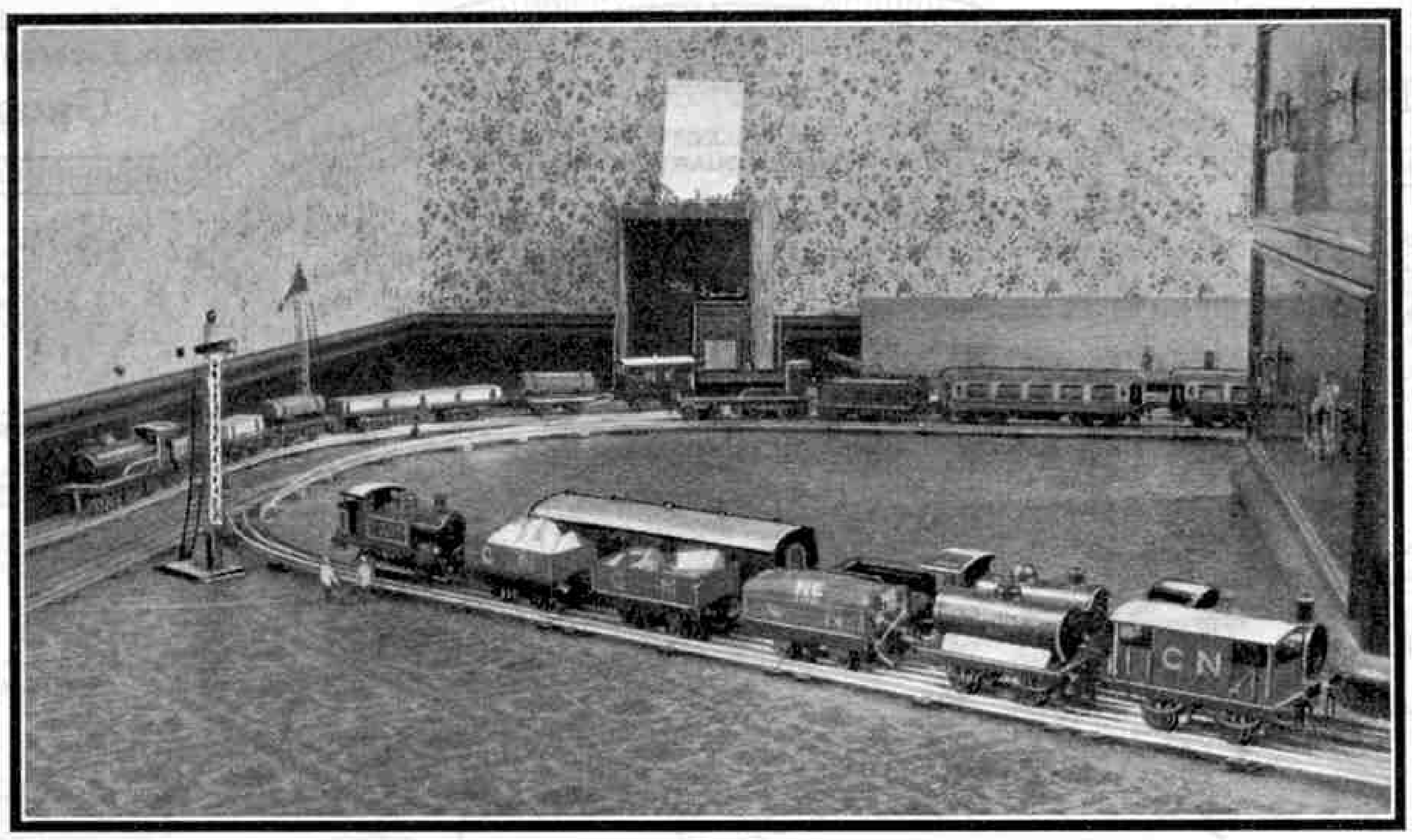
Having settled on the main features of the baseboard, we now come to the manner in which it is put together and supported. The most convenient height depends on that of the operator and on the length of his arm, for he will not wish to have the trains beyond his reach at any point on the widest section of the board. In most cases a height of 2 ft. 9 in. will be suitable, but this may be varied a little in order to suit special cases.

The next point to consider is whether the layout is to remain permanently in position or not. If it is not to be disturbed the supports may be firmly fixed to the floor or, or if the board is to run along a wall, strong supporting brackets may be used. In other cases the baseboard must be erected in such a manner that it may easily be dismantled. This is best done by using trestles as supports. These may be made from square section wood, of dimensions 1 in. by 1 in., that may readily be obtained from any timber merchant or builder.

Care should be taken to brace these sufficiently to enable them to stand up to their work, and if a really serviceable layout is to be constructed it is important that they should be of the same size and type.

It may be noted that, even for permanent layouts, trestles usually make far better supports than wall brackets, unless these are really substantial and firmly fixed. Where trestles are used the track may be levelled more easily, and as the weight is distributed more evenly sagging is practically impossible.

It is not absolutely necessary to use trestles, for large boxes such as are used for packing soap make excellent substitutes that have the advantages of being cheaper and requiring no making. These should be nailed or screwed to the floor in order to give firmness to the layout and if necessary their origin may be disguised by painting them or covering them with suitable material.



Part of the extensive electrically-operated layout of G. M. Lane, Wakefield (H.R.C. 11,170). Current is supplied to the sections of the layout by means of push-buttons made up from Meccano parts, and the speed controller and reversing switch are similarly constructed.

One disadvantage of the use of boxes for this purpose is that usually the layout built on them is somewhat low. This is not a serious fault, however, for it enables the operator to reach with ease the furthermost part of his model railway.

Next comes the construction of the baseboard itself. Tastes differ in regard to the kind of wood to use and the best way to build this up. Smoothly planed planks may be used, but we find that tongued and grooved matchboarding is quite satisfactory. This may readily be obtained and is not expensive. It must be used upside down in order to avoid having furrows between the joints of the boards, and these must be tightly fitted together. Cross-battens are advisable in order to hold them together and to prevent warping. For these the 1 in. by 1 in. stock already referred to should be employed. They should be fixed directly to the matchboarding, and strong supporting pieces placed lengthwise beneath it. Screws should be used throughout for making the necessary connections.

A point of importance is that the lengths of matchboarding must run in the same direction throughout. For instance, in the case of a model railway track laid down in the form of an oval, the long straight sides of the baseboard may be composed of two or three lengths, and the short sections on which are the curved portions of the track should be built up of shorter lengths running parallel to them. Thus in some portions of the track the rails follow the joints, while in others they are at right angles. A baseboard built up in this manner and supported by trestles or boxes forms a solid and convenient base for a layout and when desired may be extended in order to accommodate additional track.

If frequent dismantling is necessary the outfit should be made in sections. In the case of the oval layout already referred to, for instance, each of the long straight planks may be divided in the middle in order to form two sections, and others may be formed of the portions of the baseboard that support the curved rails. In fact, it is an excellent plan to build up the baseboard in sections even when the layout need not be disturbed, for if this is done extensions and rearrangements are more easily carried out.

A little care should be used in joining the sections together in order to avoid unsightly ridges or gaps that may prevent the track laid down from maintaining its level. Here again, the square-section wood already mentioned may be used. Short pieces should be employed to connect the portions together in the same manner as fishplates connect rails. They should be firmly screwed in the desired position, and when it is necessary to break up the baseboard the screws in one section only need be withdrawn.

G. M. Lane (H.R.C. 11,170) at the centrally-placed control panel of the miniature railway shown in the upper illustration on this page.

A baseboard that is well designed and put together in the manner suggested will give no trouble and will remain quite sound for a very long period. Additions and alterations may be carried out with a minimum of trouble, but as much forethought should be exercised in regard to these as in making the original baseboard itself.

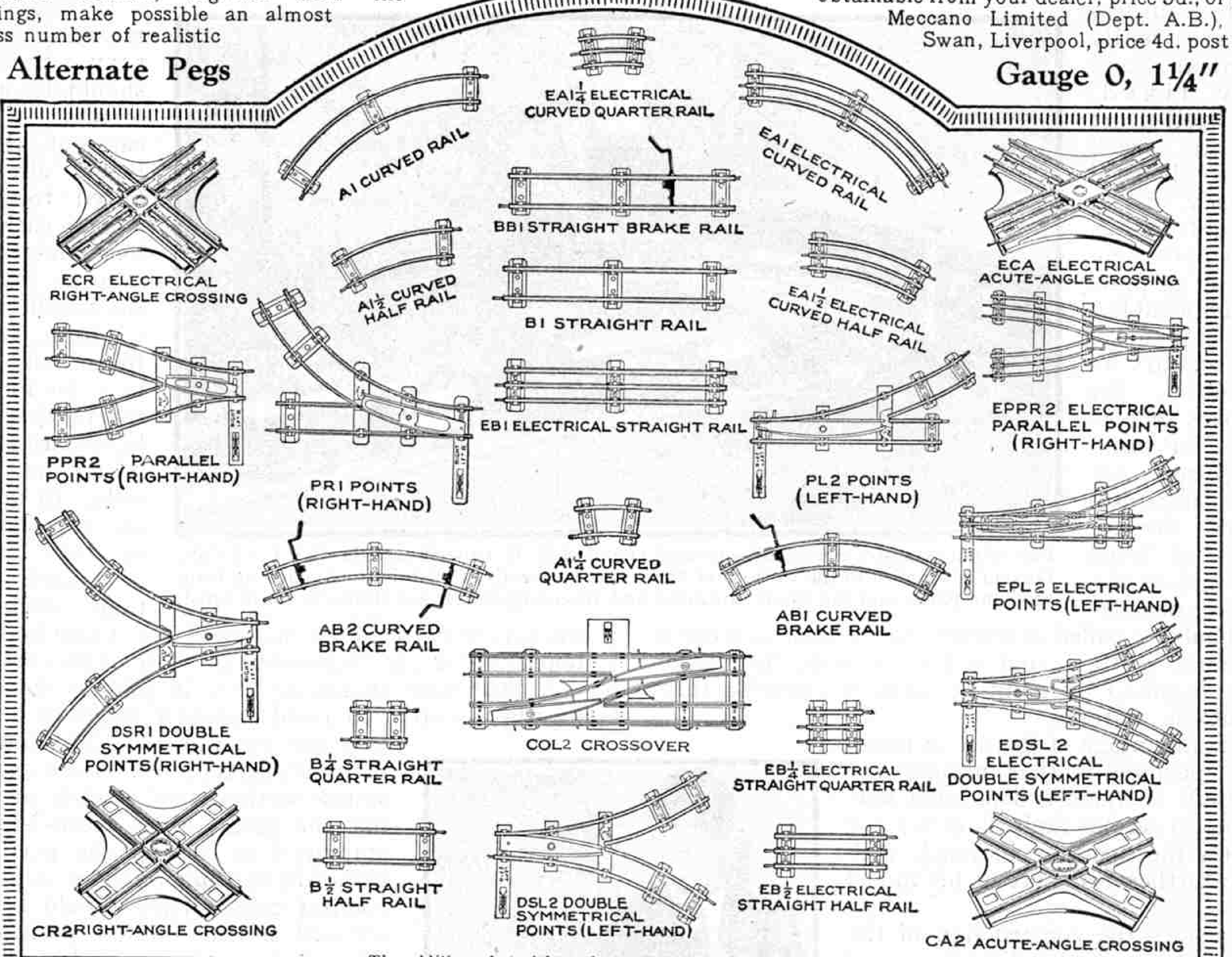
There is no absolute necessity to paint the woodwork of the baseboard and its supports, especially if stations and scenic effects generally are to be employed. This, of course, usually is the case and together with the ballast these accessories will be found to cover quite a large proportion of the area of the baseboard. If it is decided to disguise the remainder, paint of a dark brown colour will be found least conspicuous, and no harm will be done if the entire surface of the board is painted before the track or any accessories are laid down upon it. When this has been carried out the rails may be laid down and the track should be ballasted to improve its appearance.

Hornby Series -:- Rails, Points and Crossings -:- Hornby Series

Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. The variety of Points, left-hand and right-hand turnout, together with the Crossings, make possible an almost endless number of realistic and railway-like layouts. The adaptability of the Rails, Points and Crossings is well shown in a special booklet "How to Plan your Hornby Railway," which is obtainable from your dealer, price 3d., or from Meccano Limited (Dept. A.B.), Old Swan, Liverpool, price 4d. post free.

Alternate Pegs

Gauge 0, 1¼"


EA1¼ ELECTRICAL CURVED QUARTER RAIL
A1 CURVED RAIL
EA1 ELECTRICAL CURVED RAIL
BB1 STRAIGHT BRAKE RAIL
ECR ELECTRICAL RIGHT-ANGLE CROSSING
A1½ CURVED HALF RAIL
B1 STRAIGHT RAIL
EA1½ ELECTRICAL CURVED HALF RAIL
ECA ELECTRICAL ACUTE-ANGLE CROSSING
EB1 ELECTRICAL STRAIGHT RAIL
EPPR2 ELECTRICAL PARALLEL POINTS (RIGHT-HAND)
PPR2 PARALLEL POINTS (RIGHT-HAND)
PR1 POINTS (RIGHT-HAND)
PL2 POINTS (LEFT-HAND)
A1¼ CURVED QUARTER RAIL
AB2 CURVED BRAKE RAIL
AB1 CURVED BRAKE RAIL
EPL2 ELECTRICAL POINTS (LEFT-HAND)
COL2 CROSSOVER
DSR1 DOUBLE SYMMETRICAL POINTS (RIGHT-HAND)
B¼ STRAIGHT QUARTER RAIL
EB¼ ELECTRICAL STRAIGHT QUARTER RAIL
EDSL 2 ELECTRICAL DOUBLE SYMMETRICAL POINTS (LEFT-HAND)
B½ STRAIGHT HALF RAIL
DSL2 DOUBLE SYMMETRICAL POINTS (LEFT-HAND)
EB½ ELECTRICAL STRAIGHT HALF RAIL
CR2 RIGHT-ANGLE CROSSING
CA2 ACUTE-ANGLE CROSSING

The addition of straight and curved brake rails supplied for Clockwork Trains makes possible a great deal more fun. By the use of the straight brake rail, trains may be brought to a standstill at the station platform in a very realistic manner.

Rails for Clockwork and Steam Trains

CURVED RAILS

1-ft. radius

A1	Curved rails	per doz.	4/6
A1½	Curved half rails	"	3/6
A1¼	Curved quarter rails	"	3/-
AB1	Curved brake rails	each	6d.

2-ft. radius

A2	Curved rails	per doz.	4/6
A2½	Curved half rails	"	3/6
A2¼	Curved quarter rails	"	3/-
AB2	Curved brake rails	each	6d.
DC2	Curved rails, double track ...	½ doz.	7/6

DOUBLE SYMMETRICAL POINTS

For 1-ft. radius curves

DSR1	Double symmetrical points, right	per pair	5/-
DSL1	Double symmetrical points, left		

For 2-ft. radius curves

DSR2	Double symmetrical points, right	per pair	5/-
DSL2	Double symmetrical points, left		

PARALLEL POINTS

PPR2	Parallel points, right ...	per pair	5/-
PPL2	Parallel points, left		

CROSSINGS AND CROSSOVERS

CA1	Acute-angle crossings (for 1-ft. radius tracks)...	each	2/-
CA2	Acute-angle crossings (for 2-ft. radius tracks)	"	1/9
CR1	Right-angle crossings (for 1-ft. radius tracks)...	"	2/-
CR2	Right-angle crossings (for 2-ft. radius tracks)	"	1/9
COR2	Crossovers, right hand ...	per pair	12/-
COL2	Crossovers, left hand ...		

POINTS

For 1-ft. radius curves

PR1	Right-hand points ...	per pair	4/-
PL1	Left-hand points		

For 2-ft. radius curves

PR2	Right-hand points ...	per pair	4/-
PL2	Left-hand points		
PSR2	Points on solid base with ground disc and lamp, and adapted for Hornby Control, right ...	per pair	8/6
PSL2	Points on solid base with ground disc and lamp, and adapted for Hornby Control, left ...		

STRAIGHT RAILS

B1	Straight rails	per doz.	4/-
B½	Straight half rails	"	3/-
B¼	Straight quarter rails	"	2/6
BB1	Straight brake rails	each	5d.
BBR1	Straight brake and reverse rails	"	1/6
DS1	Straight rails, double track ...	½ doz.	6/6
RCP	Rail connecting plates	"	4d.

Rails for Electric Trains

STRAIGHT RAILS

EB1	Straight rails	per doz.	7/-
EB½	Straight half rails	"	4/6
EB¼	Straight quarter rails	"	4/-
EDS1	Straight rails, double track ...	½ doz.	8/6

CURVED RAILS

1-ft. radius

EA1	Curved rails	per doz.	8/-
EA1½	Curved half rails	"	5/-
EA1¼	Curved quarter rails	"	4/6

2-ft. radius

EA2	Curved rails	per doz.	8/-
EA2½	Curved half rails	"	5/-
EA2¼	Curved quarter rails	"	4/6
EDC2	Curved rails, double track ...	½ doz.	9/-

CROSSINGS

ECA	Acute-angle crossings	each	4/-
ECR	Right-angle crossings	"	4/-

POINTS

For 2-ft. radius curves

EPR2	Right-hand points ...	per pair	10/-
EPL2	Left-hand points		

DOUBLE SYMMETRICAL POINTS

For 2-ft. radius curves

EDSR2	Double symmetrical points, right	per pair	12/-
EDSL2	Double symmetrical points, left		

PARALLEL POINTS

EPPR2	Parallel points, right	per pair	12/-
EPPL2	Parallel points, left		
TCPL	Terminal connecting plates (low voltage)	each	1/6

Electrical Points for 1-ft. radius curves are not supplied

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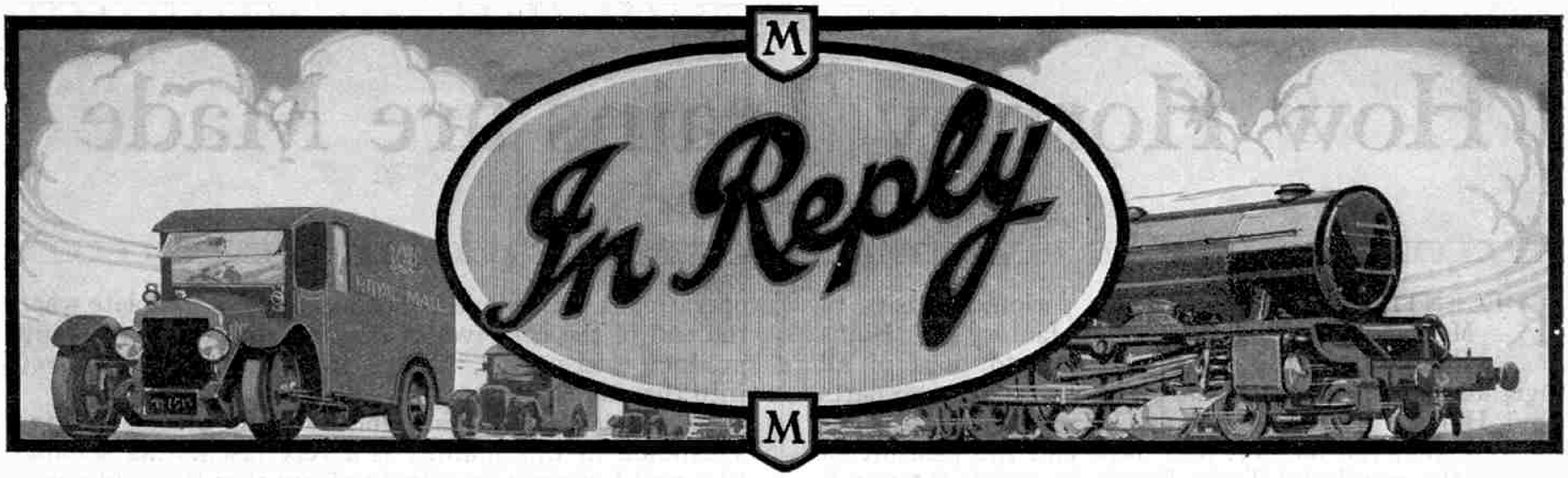


Suggested Hornby Train Improvements

POINT SLEEPERS FITTED FOR CONNECTING PLATE.—We note with interest your suggestion that the long sleepers of points should be fitted to allow the next section of rail to be joined up by means of a connecting plate. Rails and points do not easily come apart unless they are forced into strained positions owing to bad design of the layout, but we have had the idea in mind for some time and shall keep it before us. (*Reply to D. J. Higgens, Barnes, London, S.W.13*).

PETROL WAGONS OF SIMILAR CONSTRUCTION TO "COLAS" TANK WAGON.—Your suggestion that for petrol Tank Wagons we should use vehicles similar to the "Colas" and "United Dairies" Wagons already has been advanced. The improved construction of this type of Tank Wagon makes it attractive and we shall carefully consider the suggestion. (*Reply to D. J. Badham, Oxford*).

PLATFORM MACHINES FIXED TO STATIONS.—We do not think that to fix automatic machines permanently to the platforms of our stations would meet with general approval, as an increase of price would be necessary. We shall consider the possibilities of fixing the machines so that they will not move with the vibration of passing trains. (*Reply to F. Antonie, Manchester*).

OPEN WAGONS WITH DROP SIDES.—We agree that vehicles of this type are in common use on real railways, particularly on Engineering Department trains, the drop sides enabling a load of ballast or earth to be readily deposited at the side of the track. We may introduce a wagon of this type later. (*Reply to R. Lockey, Bristol*).

ELECTRIC CROSSOVERS.—An electric crossover would be a popular addition to the Hornby System and the demand for it is growing. We hope therefore to include one when our present range of rails and points is increased. (*Reply to F. Donaldson, Keswick*).

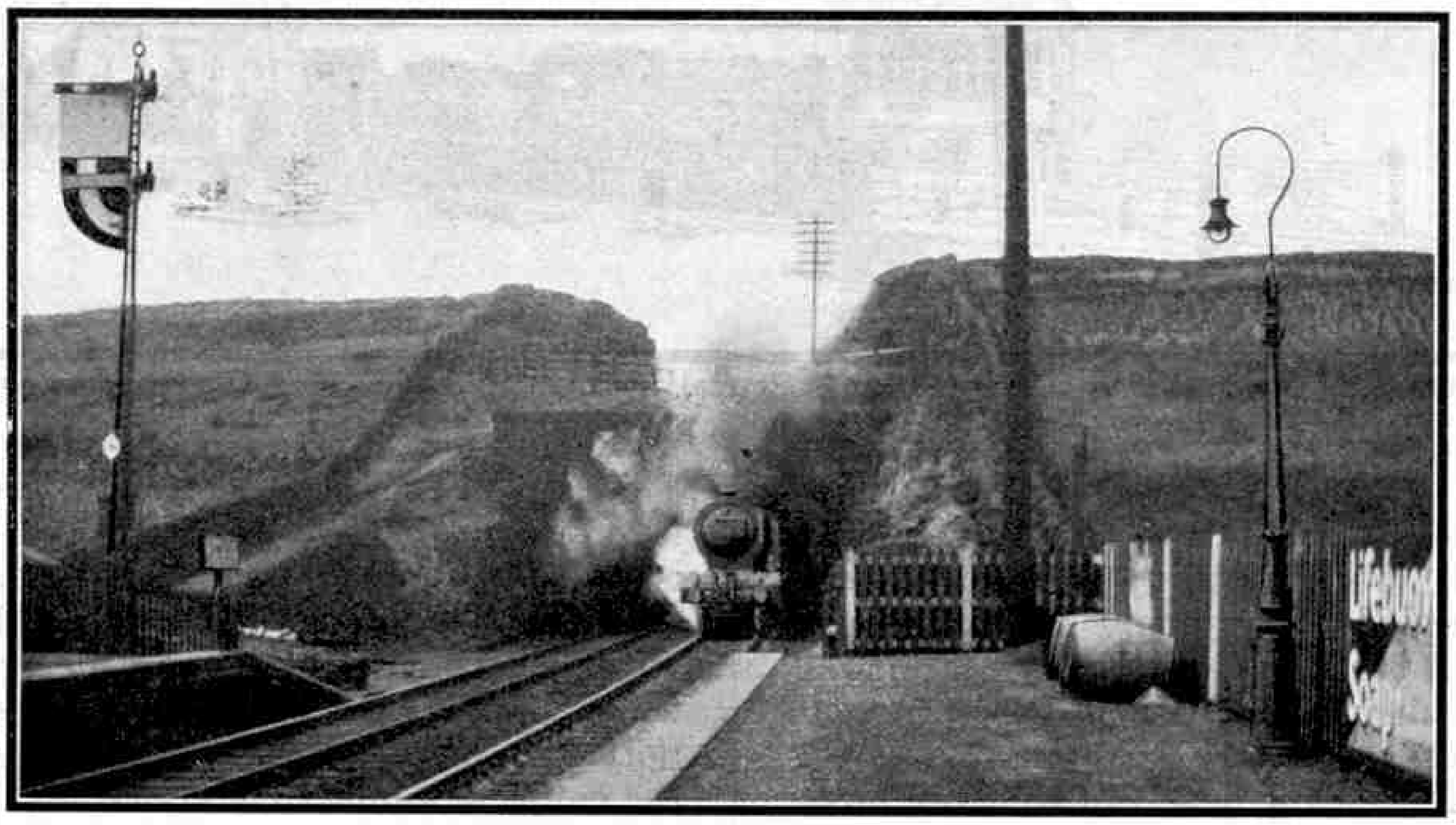
MOTOR CAR WAGON.—The open type of carriage wagon formerly used for the conveyance of motors is now being replaced by the more modern covered van. We suggest that for the present you use the Hornby No. 2 Luggage Van, which would be quite suitable for the purpose. We will bear your suggestion in mind when additions to the Hornby System are being considered. (*Reply to R. Nailor, West Acton, London*).

LONGER STATIONS.—Stations may be lengthened by adding sections of "Passenger Platform." These are sold complete with fencing at 3/6 each. They are 16¾ in. in length, and by placing one on each side of the No. 2 Hornby Station, a platform capable of accommodating three or four-coach trains would be formed, thus solving your difficulty. (*Reply to W. Clark, Oldham*).

LONGER CHIMNEYS FOR No. 1 TANK LOCOMOTIVES.—We note with interest your suggestion that a smaller boiler and a taller chimney should be fitted to our No. 1 Tank locomotives. This alteration would give the engine a greater resemblance to the average small tank locomotive used for shunting purposes, but we do not think that the high cost of the change would be justified by any subsequent increase of popularity. We shall consider fitting a safety valve as you suggest. (*Reply to H. Bailey, Penrith*).

MINIATURE WEIGH-BRIDGE.—We do not quite see the practical value of a miniature weigh-bridge. The fine mechanism involved would be costly to make and for this reason the demand would be comparatively small. (*Reply to B. Johnson, South Shields*).

DOUBLE TRACK CROSSING.—We are of the opinion that there would not be a sufficient demand for double track crossings of right angle and acute angle pattern to warrant their introduction at present. Very few layouts could accommodate such crossings. (*Reply to R. Roberts, London, S.W.17*).



L.N.E.R. (N.B. Section) 4-4-2 locomotive No. 9874, "Dunedin," giving the first puff after emerging from the tunnel at North Queensferry, preparatory to crossing the Forth Bridge. This photograph was taken by our reader, E. W. Baker, Frinton-on-Sea.

L.M.S. CLASS 2P LOCOMOTIVES.—We were very interested in your idea that a model of an L.M.S. Class 2P Locomotive could easily be made from the existing parts of the Hornby Midland Compound, leaving out the cylinders, slide bars and connecting rods. We have already experimented with this idea and find that it would be quite satisfactory. Your suggestion will be carefully considered. (*Reply to D. McIntyre, Bristol*).

RUSTLESS RAILS.—Suggestions that these should be introduced have previously been made. They would be very suitable for outdoor working, but would be too expensive to be popular with many Hornby Train owners. (*Reply to G. D. Garratt, Wolverhampton*).

NEW TENDERS FOR No. 3 LOCOMOTIVES.—It is proposed to supply these with No. 2 Special Tenders and thus greatly enhance their general appearance. These locomotives are being fitted with new No. 2 Special Mechanism, giving them improved performance. (*Reply to W. Brian, Harrogate*).

DOUBLE BOGIE OPEN WAGONS.—Although this type of wagon is in use on British railways, we do not consider that its introduction would be justified by the demand, and we are afraid that we are unable to include it in the Hornby System. (*Reply to W. Davies, Barmouth*).

THREE-WAY POINTS.—Points of this kind are not very satisfactory in operation, owing to the closeness of the various switch-rails. The type is not often met with in real practice and we do not think they would prove popular with the majority of Hornby Train enthusiasts. (*Reply to R. James, Swansea*).

SEPARATE TUNNEL MOUTHS.—You will be pleased to learn that separate tunnel mouths will be obtainable in a very short time. When ready an announcement will be made in the "*M.M.*" (*Reply to P. Nelson, Northampton*).

HIGHER PLATFORMS.—We note your suggestion that the station platforms should be made slightly higher in order to bring them to the correct height for our rolling stock. We are considering the remodelling of stations and if this is done the question of platform heights will be revised. (*Reply to B. Colin, Cromer*).

SINGLE SLIP CROSSING.—The particular situation on your layout calls for the use of what is known in real practice as a single slip crossing. This type is not in great demand and it is unlikely that we shall introduce one, as it would necessarily be complicated and costly. (*Reply to S. D. Woolger, Baldslow, Sussex*).

INTER-CONNECTED BRAKE RAIL AND HOME SIGNAL.—We were extremely interested in your proposal for a combined brake rail and home signal so arranged that the brake on a locomotive is applied when approaching the signal, if this is in the danger position. This would be an attractive and realistic addition to the Hornby System, and probably we shall make experiments to enable a suitable form to be designed. As soon as a decision is made an announcement will appear in the "*M.M.*" (*Reply to K. Parry, Blyth, Northumberland*).

DARK SLEEPERS FOR DOUBLE TRACK.—Colouring double track sleepers black would give a more consistent appearance to a layout composed of single and double track. We shall give careful consideration to the suggestion. (*Reply to E. Mallalieu, Leamington Spa*).

"COW-CATCHERS" FOR LOCOMOTIVES.—The demand for locomotives to be fitted with a cow-catcher and a large electric head-light would be limited, and at present we do not propose to manufacture them. We suggest that you should construct a cow-catcher of wire soldered together, and attach it to the buffer beam of your locomotive. (*Reply to E. Mathews, Johannesburg, South Africa*).

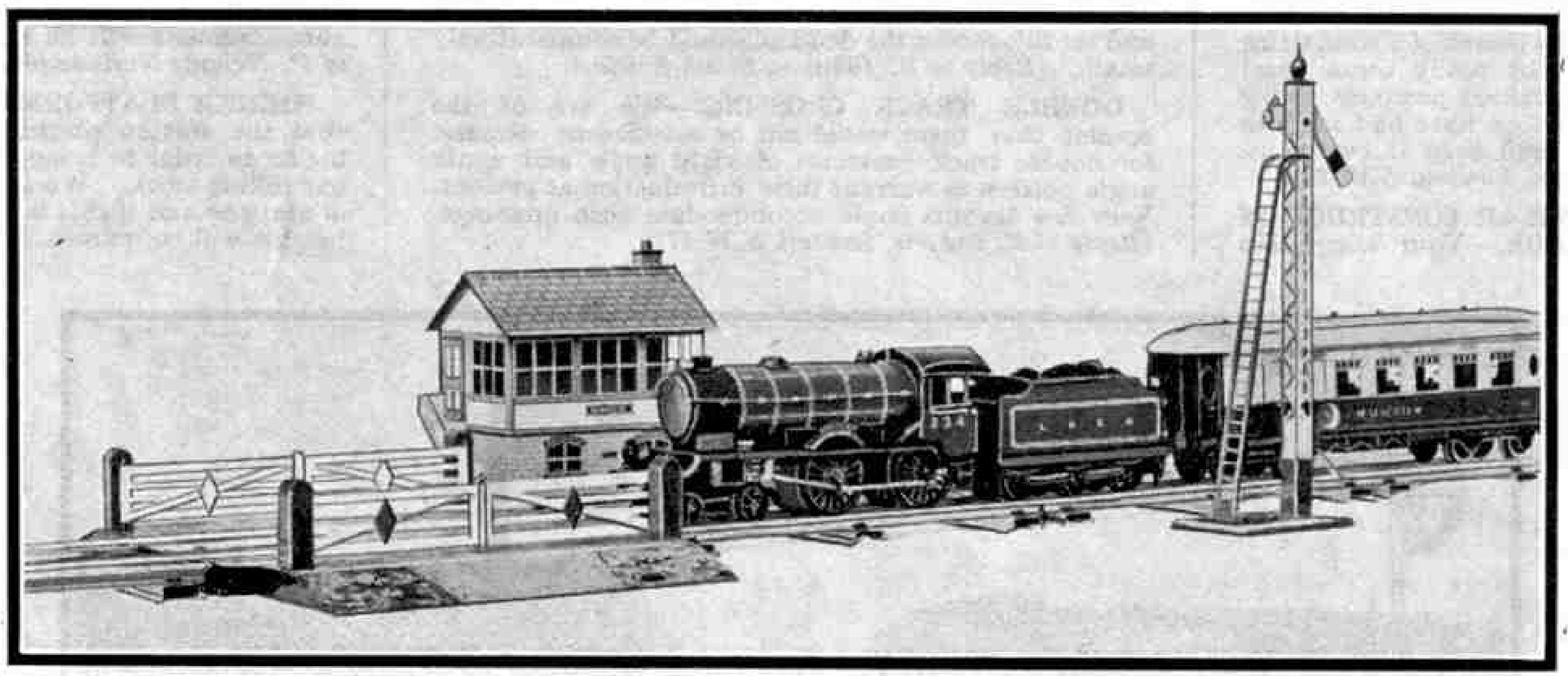
UPPER QUADRANT SIGNALS.—Although these signals are becoming more common in Great Britain, and are largely used in America, we doubt whether they will ever be as universal as the present standard semaphore signal. Modern practice tends more and more towards the adoption of the colour-light system of signalling, which has a great advantage over ordinary types in foggy weather. If our railways adopt the upper quadrant signals generally, we shall certainly consider making reproductions for use in the Hornby System. (*Reply to W. Hanson, Leyton, Essex*).

No. 2 SPECIAL LOCOMOTIVE.—We were interested in your suggestion that spare lamp brackets should be placed on the footplates of the G.W. "County" class locomotives, but we think that such a small detail could be ignored without lessening the realism of the engine. The addition of small details, such as sand boxes and sand pipes, would add greatly to the cost of the locomotives, and if true to scale, these would be very small. (*Reply to C. Scott, Westbury*).

How Hornby Trains are Made

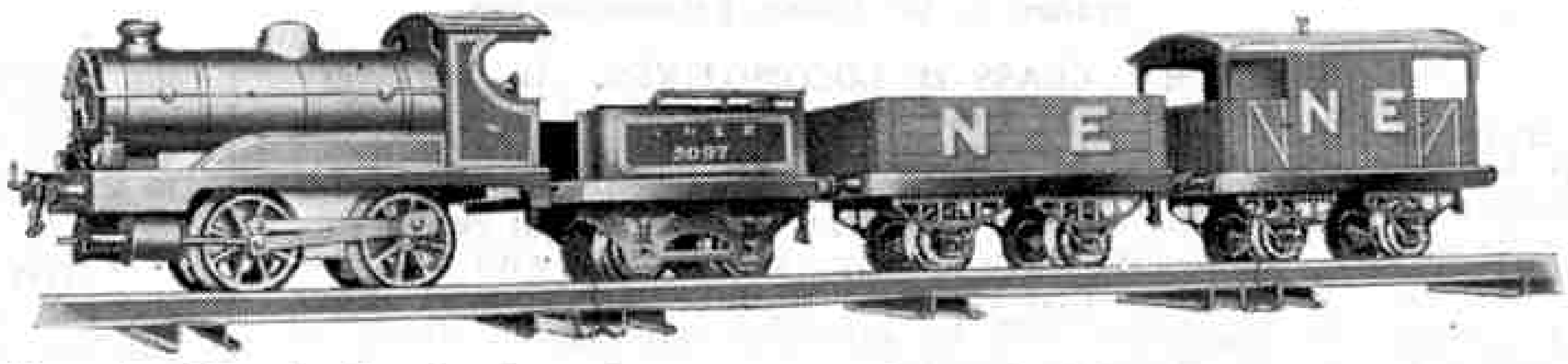
By "Tommy Dodd"

RECENTLY I paid one of my periodical visits to Meccanoland, the wonderful factory in Binns Road, Liverpool, that is known to boys of all ages all over the world as the place where Meccano parts and Hornby Trains are made. Many fortunate boys have visited the factory, and have had the pleasure of seeing the wonderful Train Room, in which thousands of Hornby Train Sets are produced every year, but for the benefit of those who are unable to come to Liverpool for this purpose, I may say that this has a floor space of more than 15,000 sq. ft. It is splendidly lighted, alternate sections of the roof being made of glass, and this helps greatly in ensuring good workmanship.


Pullman train drawn by a Hornby No. 2 Special Locomotive approaching a level crossing.

I do not suppose that many young visitors ever have time to notice this, however, for immediately on entering their attention is drawn to the bewildering array of Locomotives, Coaches, Wagons, Rails, Stations, Engine Sheds, Signals and countless other accessories that are being rapidly put together by busy fingers. The vast room is occupied by an army of workpeople, who deftly fit together parts made in other sections of the factory and under their hands the finished products are fashioned and packed into the familiar boxes, the sight of which has gladdened the hearts of so many boys.

Down the centre of the great factory runs a wide corridor on each side of which are the Tool Rooms, Press Shops, Spraying Departments, etc., in which the parts necessary to build up Hornby Trains are made. Visitors pass down this corridor and suddenly emerge into the centre of the busy Train Room itself. I have often entered it in this manner, but at every visit I am again struck by the almost bewildering variety of the work carried on in it. Although everybody is very busy, nobody is rushing about in a furious manner, or becoming wildly excited, because each knows the work that is to be done and carries on with it in a quiet and efficient manner.


Hornby No. 1 Goods Set, the construction of which requires no less than 1,583 operations.

The parts required are brought into the room by means of electric trucks and they pass along the working benches on conveyors that travel down the centres. In order to have some part added, each locomotive, coach, or wagon in process of building is lifted off the conveyor, and when the task is finished it is immediately replaced to be carried along to the point where the next operation is to be made. The assembly is complete when the end of the conveyor is reached, and the newly-built product is inspected, packed into its box and removed into the stores.

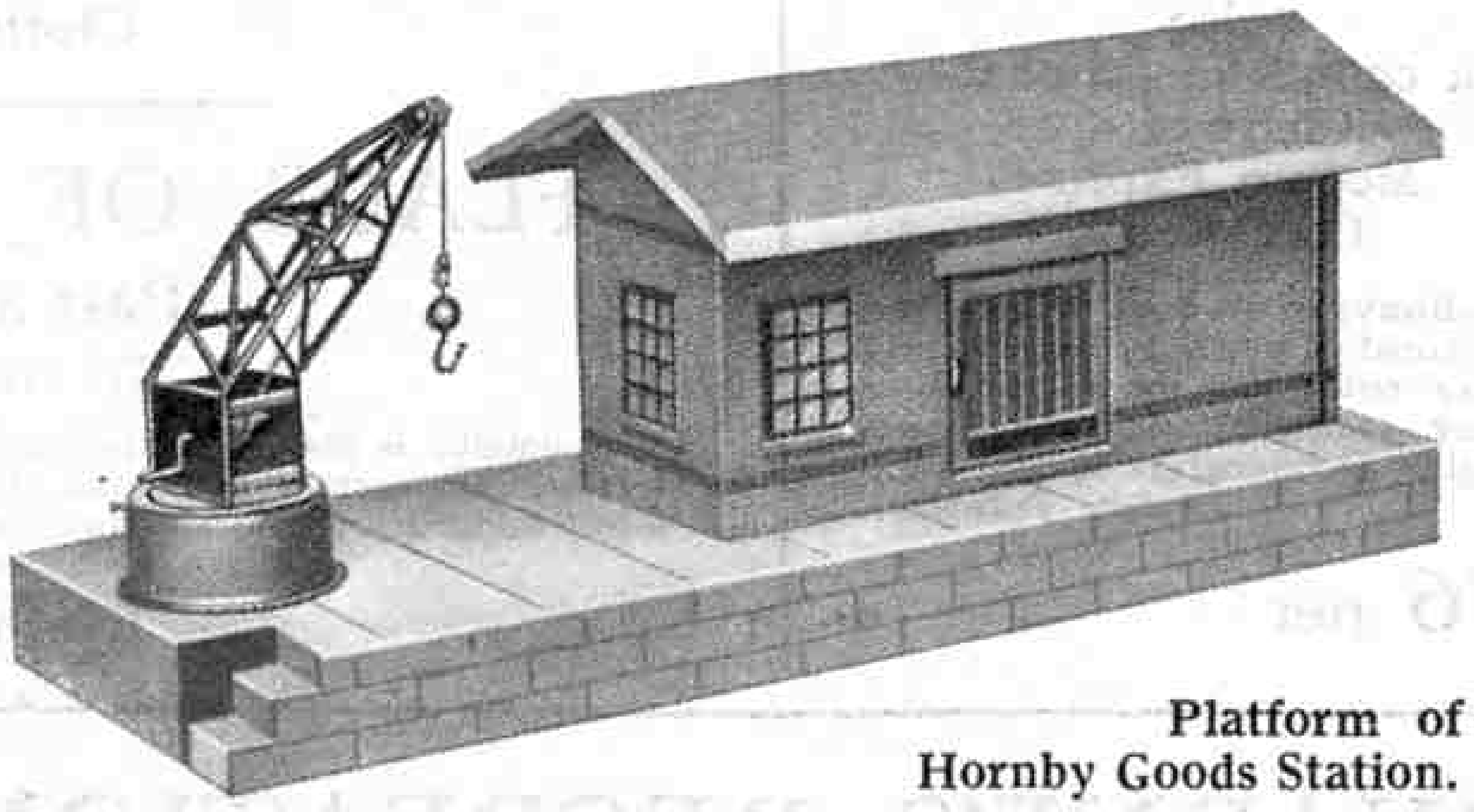
To watch a well-known Hornby Train accessory being assembled in this manner is a very fascinating occupation, and I was not surprised to learn that the guides who escort visitors round the factory do not find it easy to persuade their young friends to leave. Most of these would willingly spend an entire day simply watching these fascinating operations. For instance, the assembly of an Engine Shed arouses great interest in all visitors, whether young or old. They watch with close attention the deft manner in which the walls and ends of the structure are fitted together by means of the lugs provided for the purpose. Then follows the roof. This is placed in a wooden jig in order to enable it to be fitted correctly and in the most expeditious manner, and finally the floor of the shed is added.

On tearing myself away from the conveyor benches on which Engine Sheds were being made, my attention was caught by a faint noise overhead. This I had not noticed previously and on glancing upward to discover the cause, I found that above my head was a conveyor belt that ran right across the room. On enquiry I found that this is used for carrying rails from the place in which they are made to that in which they are packed in Hornby Train Sets.

I traced the conveyor back to the place from which it started and found myself at the rail assembly tables. There I was surprised by the speed at which the lengths of complete rail were built up. This, of course, is the result of careful organisation. The rails themselves are made in a separate part of the factory. I have often watched their manufacture from large sheets of tin plate and have marvelled at the rapidity with which the sheets are cut into strips of the required size by one machine and stamped into rails in one operation by a second. A conveyor belt delivers them to packers, or, if they are to be curved, carries them to the revolving wheels of the machines that " mangle " them into correct shape. Both straight and curved rails are then taken to the Train Room by an electric truck.

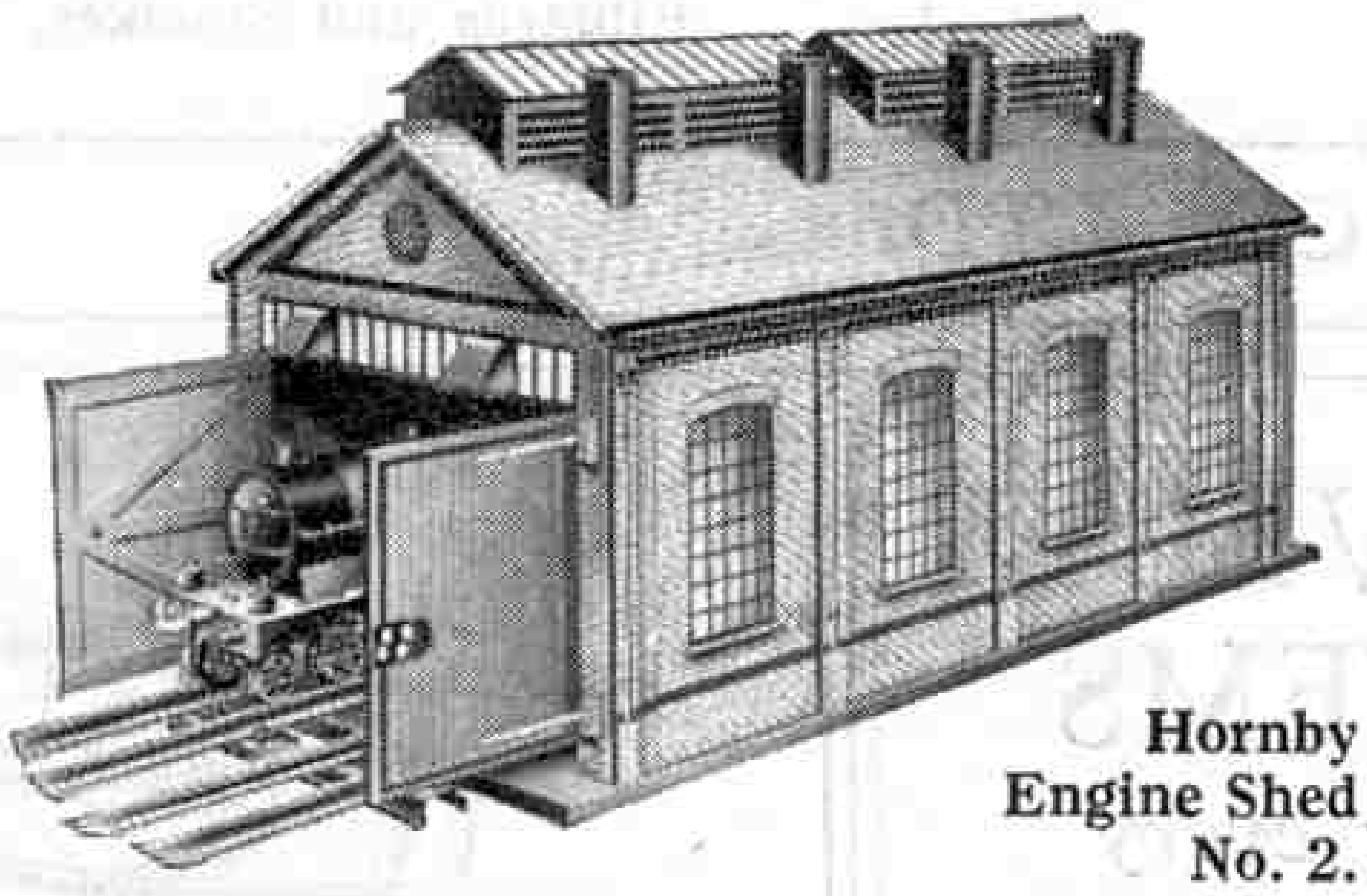
In the second stage of manufacture the rails travel as quickly as in the first. Three sleepers are rapidly threaded on to each rail. These are spaced out into their correct positions by means of a gauge and the rails fastened down on them by a press that stamps the six pairs of lugs in one movement. To slip in the connecting pins at the ends of the rails and to nip them in position in another machine is the work of a second or two and the rail is then complete.

Between operations each rail passes along the bench on a belt conveyor. When finished it is again dropped on the belt, from the end of which it falls into the pockets of a conveyor that carries it up towards the roof and shoots it on to the overhead belt system that I heard moving above me.


Platform of Hornby Goods Station.

While watching the rapid progress down the assembly line of a procession of rails I was informed that from 14,000 to 16,000 of these are completed daily, and that the number of sleepers stamped out in a year on the giant presses in another part of the factory is nine millions!

In imagination I piled these millions of sleepers into heaps and stretched them end to end in the effort to realise exactly what the enormous number meant. After a few unsuccessful efforts to picture this army of sleepers I remembered that there are three to each rail and soon calculated that the nine million sleepers would suffice for a Hornby track 480 miles in length. This corresponds to a full scale line of about 22,000 miles in length, which is a little more than the length of the track of the Canadian National Railways, usually regarded as the longest in the world. It seems to me that the Hornby Railway is now entitled to a world's record, for this length of track is added to it every year!


Hornby Engine Shed No. 2.

The tables on which the No. 2 Special Locomotives were being assembled next claimed my attention. These splendid reproductions in miniature of handsome engines of each of the four great railway groups are now great favourites with Hornby Train owners who are delighted as much by their strength and endurance as by the faithfulness with which they reproduce the features of their originals.

Hornby Railway Station No. 2.

I walked slowly down one of the tables, keeping pace with the conveyor in order to follow each detail of the assembly, and noted the splendid finish of each part used. As I did so I began to wonder how many parts actually went into one of them. Just then Mr. Hornby joined me and I immediately asked him. Without any hesitation he said that there were exactly 100 parts in each locomotive. I was startled by this number, and still more so when he went on to say that in it the motor is counted as one part only. In the entire locomotive there are actually 200 separate parts. Each one of these requires careful planning and making, and finally they must be put together to make a complete engine, a task that must be performed with exactitude.

On learning this I began to acquire new respect for my locomotives and resolved that in future I would treat my Hornby No. 2 Specials even more carefully than before, lest any of the parts should be broken or lost.

Mr. Hornby seemed amused by my astonishment at the number of parts that went to the making of a locomotive and suggested that when I got home I should dismantle my "Shire" engine in order to see if they were all there. I did not make any promise to do so, assuring him instead that I was quite content with his counting.

He then remarked that few people realise how complex a Locomotive or Train Set is.

"Do you know how many operations are necessary in making a No. 2 Special Passenger Set?" he asked.

Warned by my experience with the No. 2 Special Locomotive, I prudently declined making a guess, and he went on to tell me that the contents of the box in which the Set is placed have been handled 2,730 times. At every one of these operations something is added, or parts already there are enamelled or baked, or fixed in position. The manufacture of the No. 1 Goods Set requires 1,583 operations, and even that of the M.1 Set involves no fewer than 726 handlings.

While Mr. Hornby had been talking we had moved across the room to the section in which are the test tracks. There every locomotive made is put through its paces before it is allowed to leave the factory. Coming to a halt in front of one of the tracks Mr. Hornby reminded me that on it the No. 1 Special Locomotive referred to in my article on page 59 of the "*M.M.*" for January last had completed a run of 22 miles without showing any signs of wear.

I answered rather briefly, for at that moment my eye was caught by the locomotive running on the next testing track. This was fitted with electric rails, on which was running a No. 2 4–4–2 Tank Locomotive that had an unfamiliar look. Mr. Hornby saw that this had attracted my attention and informed me that this electric locomotive was one of the new products to be introduced into the Hornby system during the present year. Naturally I examined it with very great care. It is a handsome engine that will be extremely popular with model railway enthusiasts, who also will be delighted with other introductions such as the platelayer's hut and the electric level crossing and turntable.

Mr. Hornby showed me models of these and from him I learned many interesting details that at a later date I hope to give for the benefit of readers of the Magazine. The two electric accessories referred to will be particularly useful, and their employment will add realism to Hornby electric railways.

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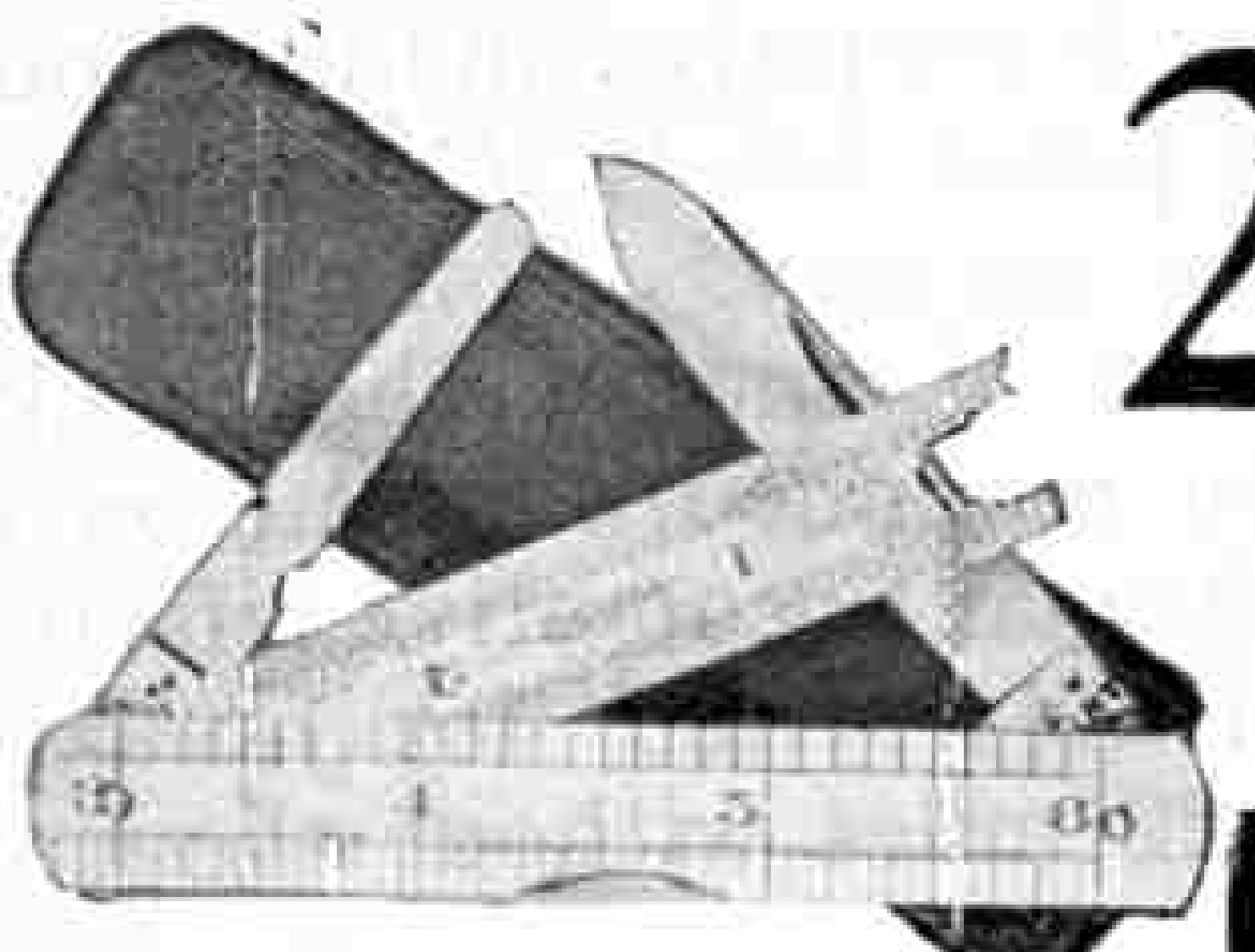

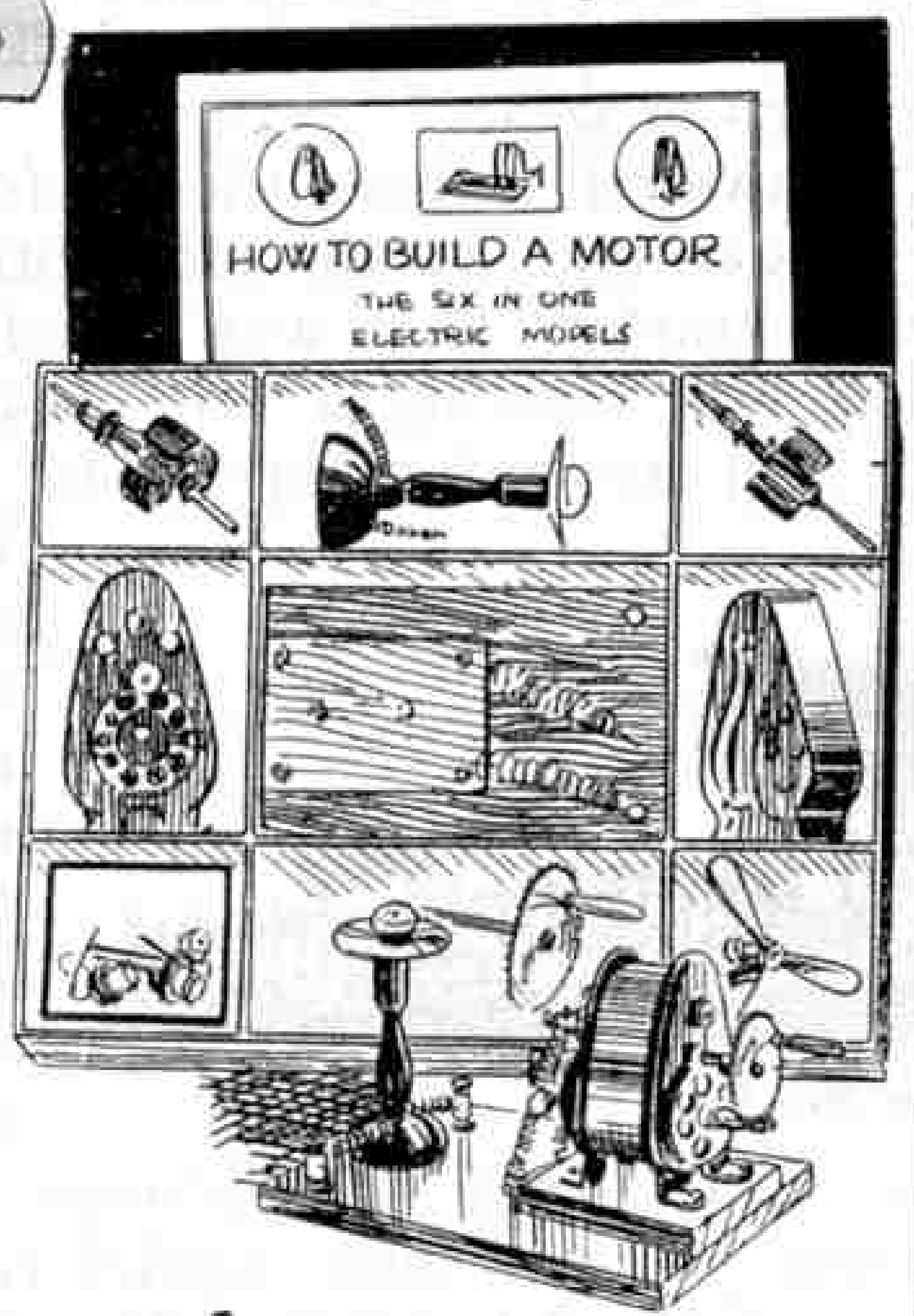

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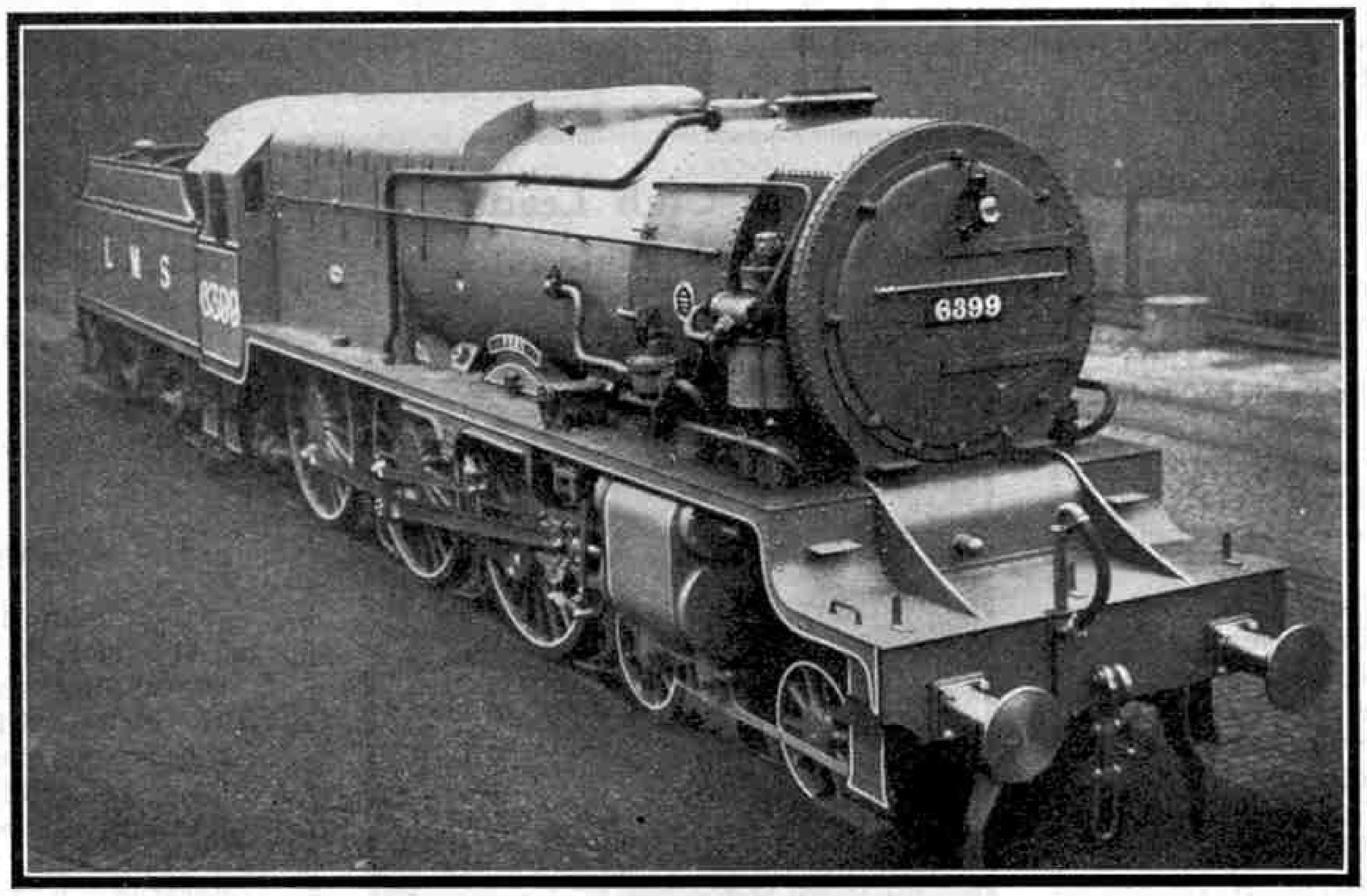
H.R.C. COMPETITION PAGE

The Steam Locomotive of 1950

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

Seventeen months' experience has shown us that the members of the H.R.C. have a knowledge of railway engineering that is of no mean order. Daily we receive from them in large numbers suggestions for additions to the Hornby system and ingenious ideas for improving model railway operations. Many of these are novel in character and all show that their authors are keenly following railway developments.

Locomotive design appears to be the favourite topic in all quarters and interest in this has been greatly stimulated by the building of the new high-pressure engines of the L.M.S. and the L.N.E.R. To a certain extent these locomotives may be looked upon as guides to what we may expect in future years. Higher pressures than at present undoubtedly will be used and design must change in order that the demand for these may be satisfied. Thus there is scope for much intelligent anticipation in trying to think out the trend of affairs in the locomotive world.



The L.M.S. locomotive No. 6399, "*Fury,*" is one of the engines that suggest the trend of future design. What will the locomotive of 1950 be like?

Since H.R.C. members are so greatly interested in problems of this kind, we have decided this month to ask them to give their ideas of the steam locomotive of 20 years hence. What this will be like in 1950 it is difficult to say. It may develop along the lines of the L.N.E.R. "10000" or those of L.M.S. locomotive No. 6399 "*Fury,*" or it may be a more strange looking engine developed from say, the Ljungström turbine locomotive. Each competitor must think out a possible line of development based on his own ideas.

A brief description of the locomotive should be given, special attention being paid to the principal features, such as the boiler, firebox, and cylinders, and if possible, competitors should submit drawings in order to make their meaning quite clear.

Competitors should take care not to allow their imaginations to run riot. For instance, in suggesting boiler developments, they should have reasonable regard for the requirements of the loading gauge. Similarly the number of wheels should not be increased so greatly that it is impossible to round curves of the radius now usual!

As usual, the competition will be divided into two sections—Home and Overseas. Prizes of Hornby goods (or Meccano if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors in each section who submit designs showing the greatest merit. A number of consolation prizes also will be awarded to the best of the remaining entries and, if necessary, neatness of presentation of ideas will be taken into consideration in making a final decision.

Envelopes should be plainly marked in the top left-hand corner—"1950 Locomotive Contest," and posted so as to reach Headquarters at Binns Road, Old Swan, Liverpool, on or before the 30th April. The closing date for the Overseas Section is 31st July, 1930. Competitors should not omit to give their H.R.C. membership number.

Grooming a Giant Locomotive

For our second competition this month we are turning to an interesting phase of railway life. Every member of the H.R.C. knows that before a giant locomotive backs on to a train it undergoes a thorough preparation. Steam is raised, tanks and bunkers are filled, bearings oiled, etc., and all is in readiness for a long run. We wish readers to give an account in not more than 500 words of the activities of the driver and fireman of such a locomotive down to the time of its departure.

Hornby goods (or Meccano products if preferred) to the value of 15/–, 10/6, 5/– and 2/6 will be awarded to the writers of the four most interesting descriptions. Envelopes should be clearly marked "H.R.C. Locomotive Essay" and addressed to the Hornby Railway Company Headquarters, Binns Road, Old Swan, Liverpool. The closing date is 30th April; Overseas, 31st July.

H.R.C. Competition Results

HOME

January "An Impossible Train" Competition.—First: J. M. Johnston (5484), Dunstable, Beds. Second: S. Lucas (2942), London, N.18). Third: J. C. Button (10335), Crewe. Fourth: J. W. Darling (8059), Dawlish, Devon. Consolation: S. N. Bailes (6431), Royston, Yorks.; C. R. Woodward (14074), West Kirby; F. D. Turner (13863), Crieff, Perthshire; A. Aldons (13259), Manchester; R. Wood (179), Manchester; T. H. Coulthard (1064), Maryport.

February "Locomotive Parts" Competition.—First: R. T. Johnston (10470), London, S.W.11. Second: J. T. Trotter (11447), London, S.E.21. Third: L. H. Black (5051), London, N.4. Fourth: E. W. Fry (12192), Salisbury. Consolation: R. G. Dodsworth (9246), Manchester; W. A. Spurr (2161), Kegworth, Nr. Derby; J. Morcom (13373), Par, Cornwall; S. Brenwell (15046), Twickenham; A. Brown (12751), Battersea; E. Blackwell (30), Oswestry; G. T. Harris (9133), Lincoln; L. White (12847), Chard, Somerset.

February "Locomotive Painting" Contest.—First: L. Rimmer (9888), Cressington, Liverpool. Second: W. N. J. Pitt (15170), Newton Abbot, Devon. Third: J. A. Hall (349), Birmingham. Fourth: G. A. Nix (2993), Mickleover, Nr. Derby. Consolation: J. B. Thompson (15176), Catford, London, S.E.6; J. Thomas (6379), Bishop's Stortford; R. Knowles (7309), Bognor Regis; A. L. Jones (5094), Abergavenny C. P. Griggs (506), Chiswick.

MECCANO GUILD

A WORLD WIDE BROTHERHOOD

Winding up the Winter Sessions

The practice of concluding the winter sessions with an Exhibition is one that is adopted almost as a matter of course by practically all Meccano clubs, and members eagerly look forward to these occasions, on which clubs are visited by parents and others who are interested in their activities. In some instances a small gathering that may almost be described as a family affair is held, and in others a much more ambitious open Exhibition is organised. In all cases no effort is spared to make the event a great success, however, and visitors and members invariably spend a jolly time together. I am always impressed by the pleasure clearly shown in the reports of these events that I receive from secretaries, and also in letters from individual members, many of whom write to tell me about their Exhibition.

Among the larger Exhibitions that have been held this year is that of the Newcastle club. This was held in conjunction with the Newcastle Branch of the H.R.C. in the hall of the offices of the "*Newcastle Evening Chronicle*," the use of which was kindly granted by the directors of this newspaper. The Exhibition was opened by Dr. J. W. Leach, the Deputy Lord Mayor of Newcastle, and a photograph of the ceremony appears on the opposite page.

A Wonderful Array of Models

Dr. Leach expressed astonishment at the wonderful array of models made by members. In his address he said that he only wished that he had had the good fortune offered to boys and girls to-day of being able to study the construction of mechanical models of this kind. He could scarcely believe his own eyes when he saw in front of him the extensive selection of models that had been prepared for the Exhibition. So many of these were to be seen on the tables in the hall, in fact, that the Leader of the club described the display as "A Lilliputian world of steel construction."

Practically every one of the models was built by the members of the club, and included Cranes, a Swing Bridge, Motor Cycles, Submarines, and Torpedo Boat Destroyers. Special interest also was taken in splendid models of the Himalayan Railway and the Water Chute, that were prominent features of the North East Coast Exhibition, and in a large reproduction of the new Tyne Bridge. These models were designed and built by Mr. G. W. Horn, the President of the Club, and he also provided an extensive Hornby Railway layout that attracted a considerable amount of attention. A crowd was constantly to be seen around the tables on which it was built, and those in charge of operations were kept very busy throughout the entire Exhibition.

The hard work put in by members was amply rewarded, for the number of visitors to the Exhibition was nearly 10,000 and the receipts were £43, although the charges for admission were only 3d. for adults, and 1d. for those under 16 years of age.

Meccano Club Leaders

No. 43. Mr. J. Kinloch, M.A.

Mr. J. Kinloch, M.A., has been the Leader of Greenock Academy M.C. since its commencement. This club was affiliated in March, 1926, and now numbers nearly 50 keen and active members.

Mr. Kinloch spares no effort to make the programme of the club attractive, and Model-building Contests and interesting visits are regularly arranged

Exhibition Proceeds put to Good Use

I am very pleased to learn that half the proceeds of the Exhibition held by the Newcastle club have been given to the Sunshine Fund organised by the "*Newcastle Evening Chronicle*." Thus the officials and members of the club have had the satisfaction of running a successful Exhibition that has greatly increased the reputation of their organisation and has improved its financial position, and in addition they have done something to bring sunshine and joy into many a dull home. The habit of devoting to deserving causes of this kind a certain proportion of the proceeds of Concerts and Exhibitions is steadily growing in the Meccano club movement.

Coming Events

In conjunction with the local Branch of the H.R.C., the Exhall Meccano Club are holding their Annual Exhibition in the Exhall Church Hall on Saturday, 12th April, from 2.30 p.m. to 8.30 p.m. Many splendid models will be on view, including Super-models on loan from Headquarters, and regular trains will be operated on an extensive Hornby Train layout. The price of admission is 6d., children half price.

On 26th April the members of the Holy Trinity (Barnsbury) M.C. are giving a Concert in their club-room, the Parish Hall, Richmond Road, proceedings commencing at 7.30 p.m. Tickets may be obtained from the Secretary, Mr. F. W. Johnson, 23, Market Street, Edgware Road, Paddington, W.2, price 2/- and 1/-, and children under 14 with an adult will be admitted at half price.

Proposed Clubs

Attempts are being made to form Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below:—

Birmingham—F. C. Stobart, 40, Watt Road, Erdington.
Bolton—Fred Walsh, 60, Turton Street.
Dublin—Mr. E. A. Walker, 132, Morehampton Road, Donnybrook.
Flint—Mr. P. Davis, 21, Halkyn Street.
Ilford—J. Smith, 98, Grange Road.
London—H. Holland, 62, Haslemere Avenue, W. Ealing.
London—H. S. Gibbs, 47, Barlby Road, North Kensington, W.10.
London—Mr. B. Stowe, 17, Greyhound Lane, Streatham, S.W.16.
Old Hill—F. Holloway, 5, Claremont Street, Old Hill, Staffs.
Port Talbot—G. Cosgrave, 22, Theodore Road, Port Talbot.
Slough—N. Lansdown, Lyndale, 6, Wexham Road.
St. Annes—S. J. Watts, 11, St. David's Road.
South Africa—R. Wallace, 29, Bell Grove, Durban.
Wallasey—Mr. R. E. Scovell, 73, Poulton Road, Seacombe.
Yeovil—J. Willey, 18, Westland Terrace.

CLUB NOTES

Queen Elizabeth's School (Crediton) M.C.—At the successful Annual Exhibition a Hornby Train layout was a great attraction. A Meccanograph loaned from Headquarters and other large models created great interest. The Bishop of Plymouth very kindly judged the models entered in the Competitions arranged. Club roll: 16. *Secretary*: H. M. Phillips, 130, High Street, Crediton.

Tynecastle School (Edinburgh) M.C.—A paper on "*Locomotives*" by Mr. P. Patrick, and a talk by a member on "*The Shore at Portobello*" were given. The Social Evening that concluded last session's programme was a great success. Club roll: 50. *Secretary*: W. Urquhart, 4, West Mill Road, Colinton, Edinburgh.

St. Peter Mancroft (Norwich) M.C.—A Social Evening attended by about 50 members and friends was greatly enjoyed. The Meccano play, "*Nonsense Nana,*" was presented, and songs and music were provided by members and visitors. The President, Rev. D. L. Saberton, M.A., thrilled the audience by relating a ghost story, the correct atmosphere being created by extinguishing the lights. Members have been divided into three sections, "Nuts," "Bolts," and "Spanners." Club roll: 26. *Secretary*: J. W. Vyse, 51, Cardiff Road, Norwich.

Pharos (Dover) M.C.—Excellent Papers have been read by members, two of outstanding merit being on "*The Construction of Dover Harbour*" and "*The Evolution of the Steam Engine.*" Members are busily engaged in building models for exhibition at a Bazaar to be held in the Town Hall during May. Club roll: 30. *Secretary*: S. E. Teasdale, 21, East Cliff, Dover, Kent.

Chertsey M.C.—The talks on "*Experiences in the Great War*" by Ex-Sergeant-Major Brown were concluded. An interesting Lecture on "*Railways*" was given by a member. A Debate was held on "*Railways v. Roads,*" and by 16 votes to three it was decided that railways offer the better facilities for travel. Boxing Nights are held regularly and are greatly enjoyed by the members. Club roll: 24. *Secretary*: E. V. A. Brown, Arbon Grove Cottage, Lyne, Chertsey, Surrey.

John O'Gaunt (Lancaster) M.C.—A novel triangular Debate was held on "*Electricity v. Steam v. Clockwork.*" The uses of these for driving Meccano models and locomotives were taken into account and the Debate was decided in favour of electricity. Two Model-building Competitions have been held. One of these was of the "Simplicity" type, and in the other members had to construct a Crane. Club roll: 20. *Secretary*: J. B. Crossland, 4, Chester Place, Lancaster.

Harehills (Leeds) M.C.—Model-building and Hornby Train Nights are alternated with special meetings that include Hobbies Nights, Yacht Nights and Surprise Evenings. At one of the last-named, talks on the "*Meccano Guild*" and the "*Meccano Steam Engine*" were given by Mr. J. Edwardes. The Party was a very great success, this being largely due to the splendid support given by parents of members. Club roll: 26. *Secretary*: J. W. Issott, 9, Milan Road, Harehills Road, Leeds.

Derby M.C.—An excellent feature is that monthly meetings are held to discuss problems that have arisen during Model-building activities. Recruiting has been successfully carried out and efforts to increase membership are to be continued. A special summer programme has been arranged and in this the Cycling Section takes prominent part. Club roll: 11. *Secretary*: R. G. Groome, 100, Uttoxeter New Road, Derby.

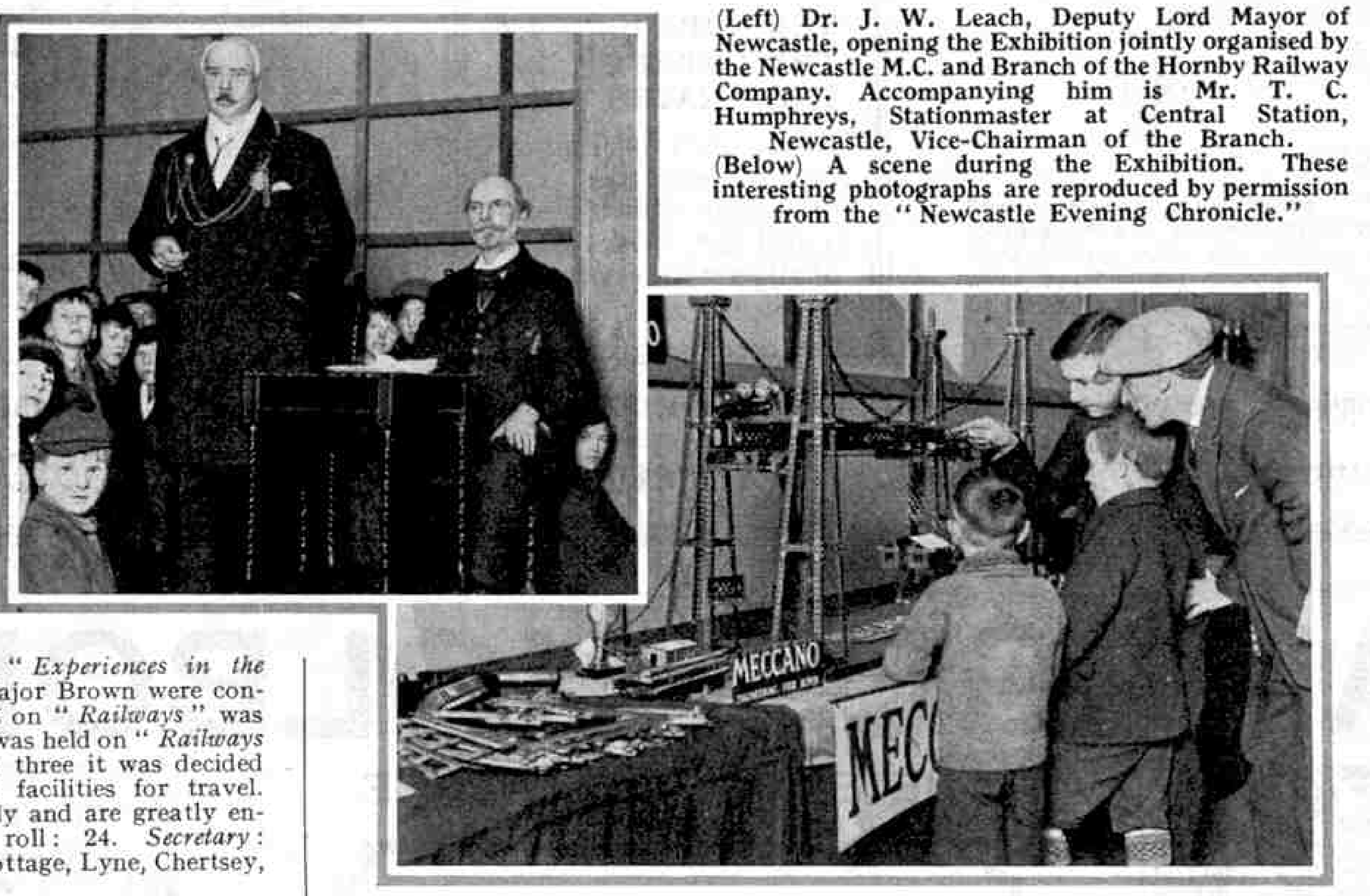
Plymouth (St. Bartholomew's) M.C.—The Second Annual Exhibition was highly successful. The models displayed included a splendid one of the latest type of Plymouth Corporation 'Bus. Mr. W. J. Vanstone of Devonport opened the Exhibition and presented the prizes. The secretary will be pleased to hear from the officials of other clubs who wish to exchange magazines. Club roll: 45. *Secretary*: Ronald Matthews, 32, Westeria Terrace, Peverell.

Albert Village M.C.—Membership shows a splendid increase and the programme continues to be very attractive. The film "*The Age of Speed*" kindly loaned by Messrs. A. Herbert Ltd., Coventry, provided a very interesting evening. The club showed models in an Exhibition at Church Gresley and several prizes were won by members. Club roll: 63. *Secretary*: L. C. Adey, 239, Occupation Road, Woodville, Burton-on-Trent.

Wallington County School M.C.—Model-building Contests have been held regularly, and the Meccano Transporter Bridge has been constructed by the joint efforts of members. A Lecture on "*A Motor Car Chassis*" was given and this was illustrated by diagrams and a demonstration of actual parts of a motor car. A Hornby Railway layout planned on ambitious lines is being constructed and realistic signalling arrangements installed. Club roll: 15. *Secretary*: H. Bond, "West View," Plough Lane, Wallington, Surrey.

Wellington M.C.—Model-building Contests are arranged regularly and Contractors' Nights have proved successful. At another meeting a recital of gramophone records was given by the secretary. Preparations for the summer session are well in hand and a Cycling Section has been formed. Club roll: 12. *Secretary*: W. A. Stone, 14, North Street, Wellington, Somerset.

Holy Trinity (Barnsbury) M.C.—The Monthly Bulletin, which contains club news and announcements of coming events, has been revived. One very interesting section is a paragraph for parents, a small space in every issue being devoted to requests and announcements of special interest to them. At the close of each ordinary meeting five minute talks on subjects of importance to boys are now given by various gentlemen, who kindly pay special visits for this purpose. Club roll: 48. *Secretary*: Mr. F. W. Johnson, 23, Market Street, Edgware Road, Paddington, London, W.2.



(Left) Dr. J. W. Leach, Deputy Lord Mayor of Newcastle, opening the Exhibition jointly organised by the Newcastle M.C. and Branch of the Hornby Railway Company. Accompanying him is Mr. T. C. Humphreys, Stationmaster at Central Station, Newcastle, Vice-Chairman of the Branch.
(Below) A scene during the Exhibition. These interesting photographs are reproduced by permission from the "Newcastle Evening Chronicle."

St. Columba's M.C.—An excellent paper on "*The Origin of the Incandescent Gas Mantle*" was given by T. Potter at one meeting. At others members constructed models for the Exhibition. This was attended by more than 400 people. Other models included a Meccanograph, loaned from Headquarters, and super-models displayed by local dealers. A Concert programme was given during the evening. Club roll: 39. *Secretary*: T. Crute, 28, Ridley Street, Southwick, Sunderland.

Portsmouth and Southsea M.C.—The Library now contains 76 books and 30 railway magazines. A splendid Sentinel-Cammell Steam Wagon was constructed by a member and a Model-building Competition brought out many other fine models. A Debate on "*Airways v. Railways*" was held, the majority of members favouring airways. Outdoor sports are to be taken up vigorously and a Cycling Section has been formed. Club roll: 30. *Secretary*: John S. Kent, 57, Kirby Road, North End.

Newcomen (Hull) M.C.—Next to the splendid models constructed by members, the chief attraction at the Exhibition was the Meccano Workshop loaned from Headquarters. The club Library is now well established. Plans for the Cricket Season are being made, and Cycle Runs and visit to Works also are being arranged. Club roll: 10. *Secretary*: H. Acklam, 103, Newcomen Street, Hull.

Hendon M.C.—The second Annual Party was held in the Town Hall, more than 100 guests being present. Prizes for the session were presented by Mr. A. Ramsey, A.M.I.E.E., who congratulated officials and members on the splendid models constructed and the manner in which the club was conducted. Club roll: 16. *Secretary*: A. Needell, 1, Sunnyfields Crescent, Hendon, N.W.4.

Greenock Academy M.C.—At the Exhibition there was a fine Display of models, including the Horizontal Steam Engine and Tank Locomotive loaned from Headquarters, and an extensive Hornby Train Layout attracted considerable attention. Visitors numbered about 300, and more than £4 was raised on behalf of the local hospital. Club roll: 60. *Secretary*: L. Langtry, 81, Newton Street, Greenock.

Sheffield M.C.—Interesting visits have been paid to the Fire Station, Post Office Automatic Telephone Exchange, and the Printing Offices of the Sheffield "*Daily Telegraph.*" Regular meetings have been devoted to Model-building, operations on the Hornby Train Layout and Lectures. New members are required and boys interested will be heartily welcomed. Club roll: 45. *Secretary*: K. Stacey, 157, Rustlings Road, Sheffield.

Bury Municipal Secondary School M.C.—The Meccano Lecture "*The Story of our Ships*" was read to members. A Meccanograph and an Overhead Railway have been constructed. A very interesting talk on "*The Construction of a Model Yacht*" was given by the Woodwork Master of the School, and a Lantern Lecture kindly loaned by the De Havilland Aircraft Co., also was very greatly enjoyed. Club roll: 14. *Secretary*: R. K. Greenhalgh, 244, Ainsworth Road, Elton, Bury, Lancs.

Attenborough Choir Boys M.C.—A member entertained the club to a splendid Cinematograph Display, making use of his own projector. At another meeting an interesting Lecture on "*Science and Conjuring*" was given by the father of the club's librarian. The Exhibition was a great success. Models constructed by members were of a high standard and aroused great admiration. Special care was taken to explain clearly to visitors the purpose and operation of each of the working models on view. Club roll: 15. *Secretary*: G. W. Render, Attenborough Lane, Chilwell, Notts.

Locket Road (Wealdstone) M.C.—In the contest between the two sections of the club the "Bolts" are slightly ahead. Interesting competitions have included a Bridge-building Contest, one in which models of a Racing Car were built, and a Cross-word Puzzle. A Meccanograph has been built by members, who get a great deal of fun and enjoyment from making designs with it. Club roll: 12. *Secretary*: J. E. Skoyles, 30, Aberdeen Road, Wealdstone, Middlesex.

Sligo M.C.—Rapid strides have been made since affiliation was granted. Model-building Competitions have been held and the Leader, Mr. J. McMenamin, gave an instructive Lecture on "*The Uses of Meccano.*" Club roll: 9. *Secretary*: K. McMenamin, 78, John Street, Sligo, Ireland.

Ludlow M.C.—Among the many models displayed at the International Exhibition were the High-speed Ship Coaler, Pit Head Gear, Oscillating Steam Engine, Drawbridge and various types of Cranes. Table-Tennis and Boxing form the chief recreations of members. Model-building Competitions also attracted keen interest. The marks given were added up at the end of the session, and prizes given by the Leader, Mr. H. Roberts, to the two members having the highest totals. Club roll: 22. *Secretary*: T. J. Flemons, 23, Corve Street, Ludlow.

Pershore, M.C.—A very attractive Display was made at the Exhibition and the hard work put in by members was fully rewarded. A large crowd of visitors were delighted with the Transporter Bridge model, which was kept working the whole evening, and also a splendid Hornby Train Layout on which trains were run to a timetable. During the evening the film "*The Age of Speed*" loaned by Messrs. A. Herbert Ltd., Coventry, was shown. Club roll: 21. *Secretary*: D. Cross, Knight's Villa, Church Street, Pershore, Worcester.

Stockton-on-Tees M.C.—At a Mechanical Toy Night members were asked to exhibit any toys of this description received as Christmas presents. The great majority brought Meccano Outfits, or models built with them. In a very successful Model-building Contest entrants were required to build a Motor Omnibus, and points were awarded for the three best efforts. A Stamp Collecting Section and a Club Library have been formed and a Magazine is published. Club roll: 53. *Secretary*: Mr. N. Middleton, 14, Victoria Avenue, Norton Hill, Stockton-on-Tees.

Camborne (Cornwall) M.C.—Model-building Contests are frequent, a recent Contest having been won by A. Batten with an excellently constructed Tipping Lorry. Evenings are frequently devoted to Woodwork, accessories for the Hornby Train layout being made. It is proposed to divide the club into four sections, and the one to secure most marks in any one month will be given charge of the model railway layout during the following month. Club roll: 8. *Secretary*: John Rogers, 47, Hughville Street, Camborne, Cornwall.

Ramsey M.C.—In addition to Hobby Night and Lectures a successful Visitors' Night has been held. Prize-winning models in a recent Contest were a Crane, a Speed Boat, and a Motor Lorry. Members inspected a local Steam Flour Mill, and an interesting visit also was paid to the Gas Works. Club roll: 13. *Secretary*: C. Butcher, Princess St., Ramsey, Hunts.

Information!!

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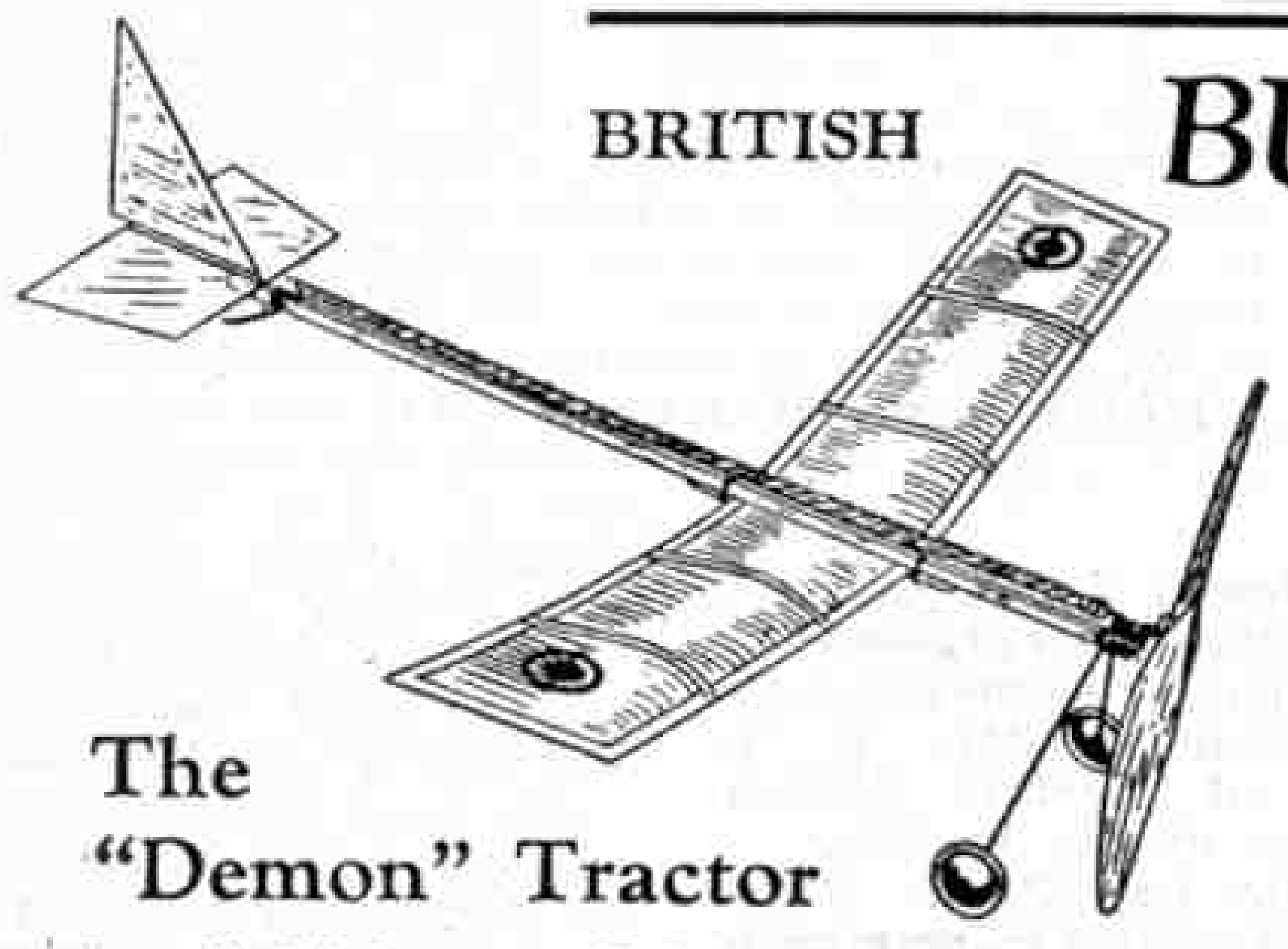

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Length 25½ in., span 23 in. Fitted 10 in. hand-carved and balanced propeller, patent double-bearing and shock-proof chassis, covered yellow proofed silk with identification discs. Weight and wind resistance are reduced to a minimum in this model, giving the utmost duration of flight. Weight 3 oz. Approximate flight 250 yards. (Pat. No. 296946). Price 7/6

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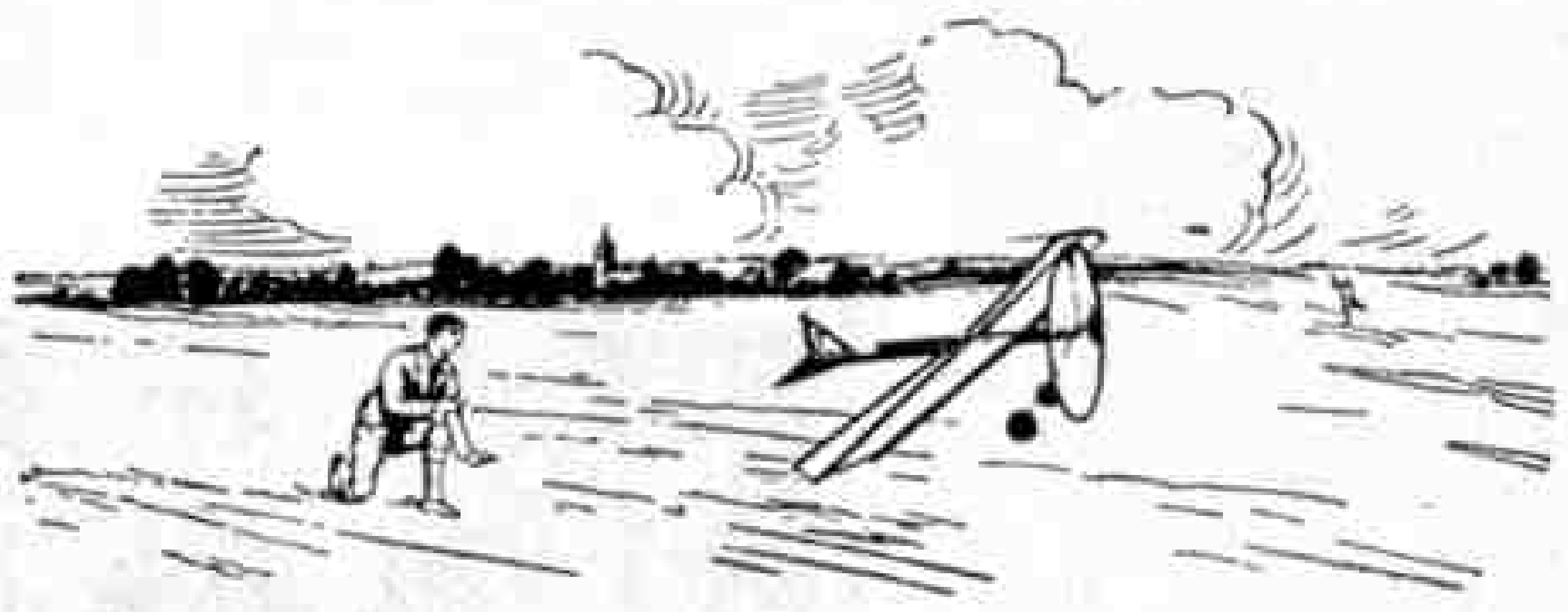

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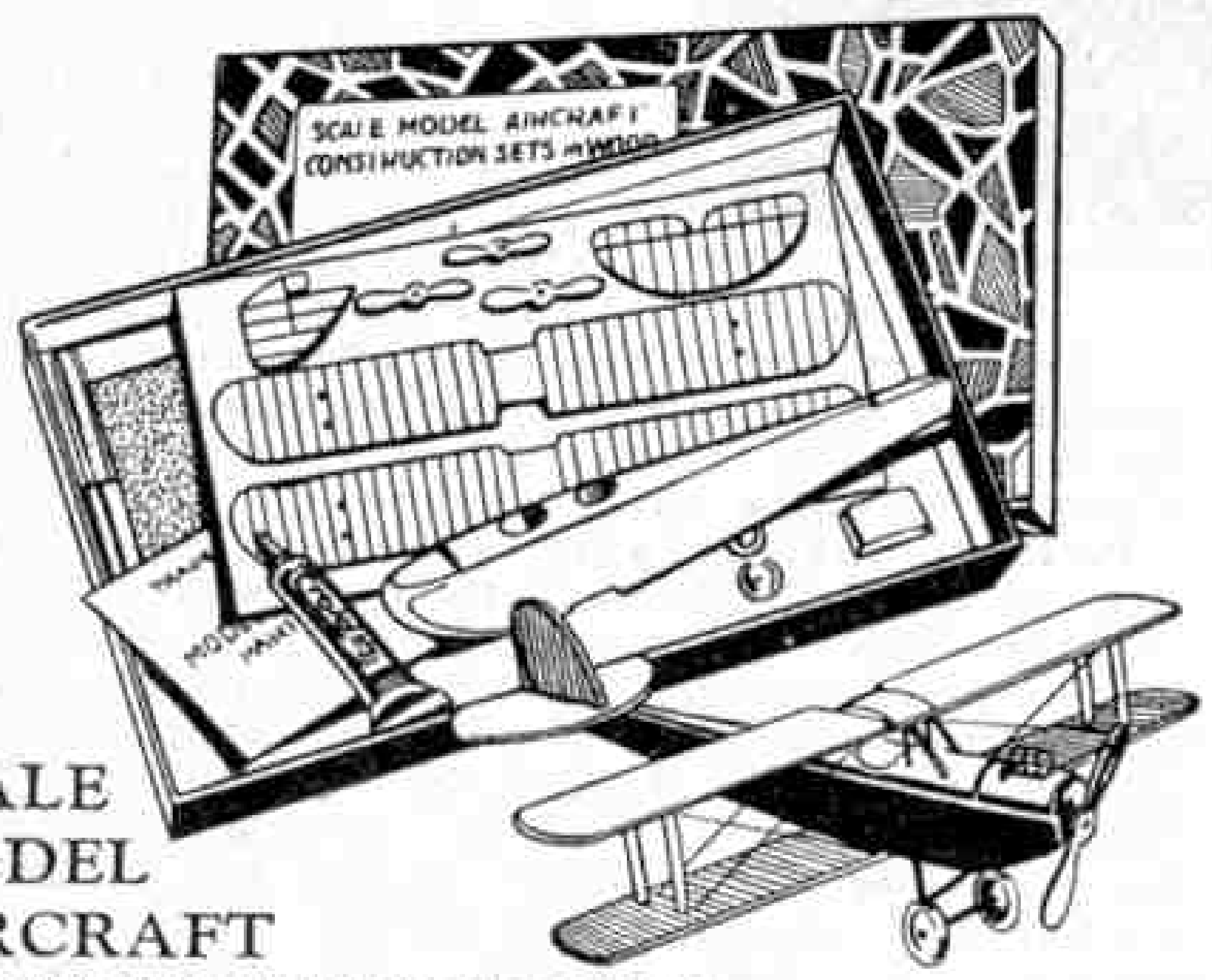
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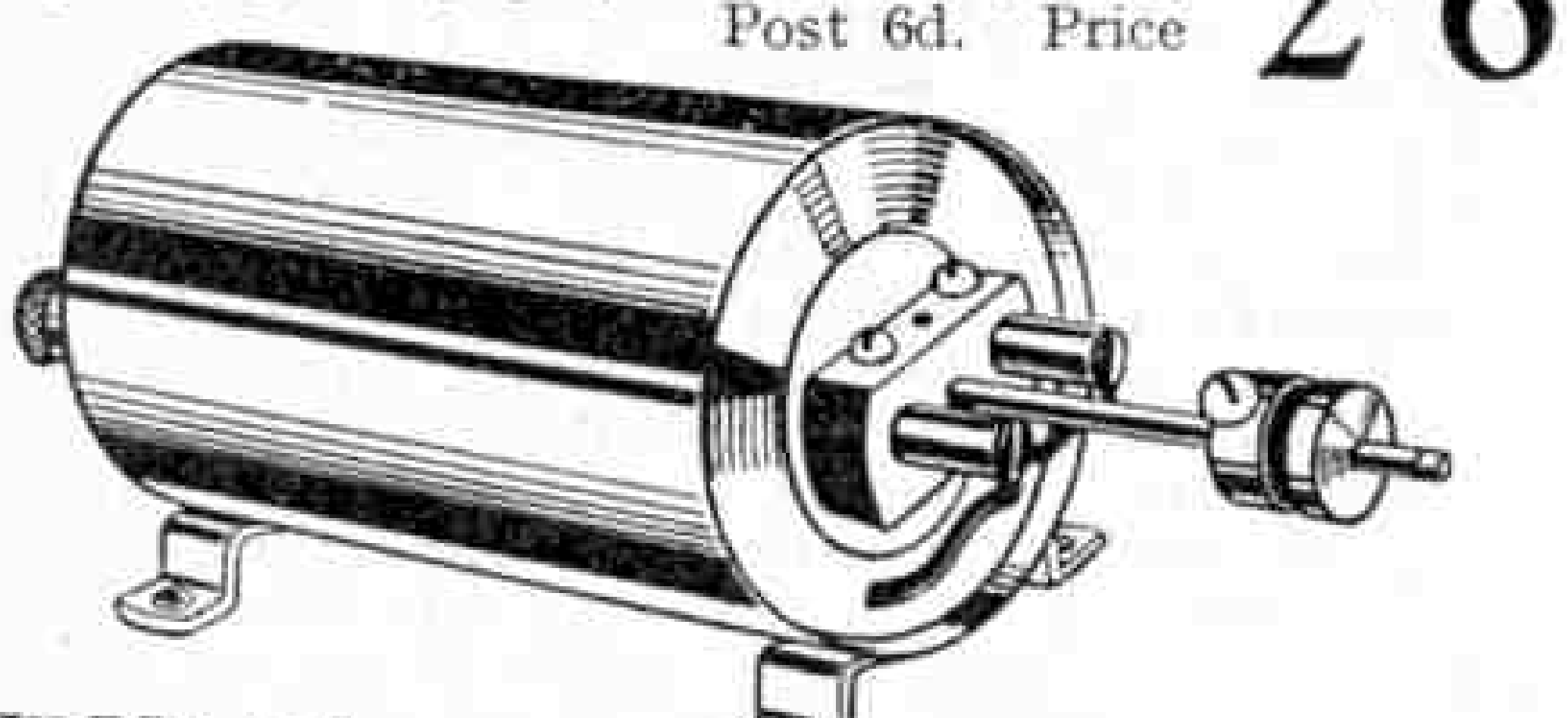
SCALE MODEL AIRCRAFT CONSTRUCTION SETS

In wood, 1/40th Scale de Havilland Moth. All the necessary parts are supplied to construct the above Model which includes the fuselage, chassis, and wheels assembled. Planes, Propeller, fin, and rudder marked out on 3-ply wood ready for cutting out blue print, glass paper, Croid Glue, etc., etc. Post 6d. Price 2/6



TUBULAR TYPE BOAT OR LOCO MOTOR

Fitted with pulley wheels for drawing models, etc. Weight 1½ lbs., length 5⅜", width 2⅛". Enclosed in brass case to work from 4-6 volts. Post 9d. Price 9/6

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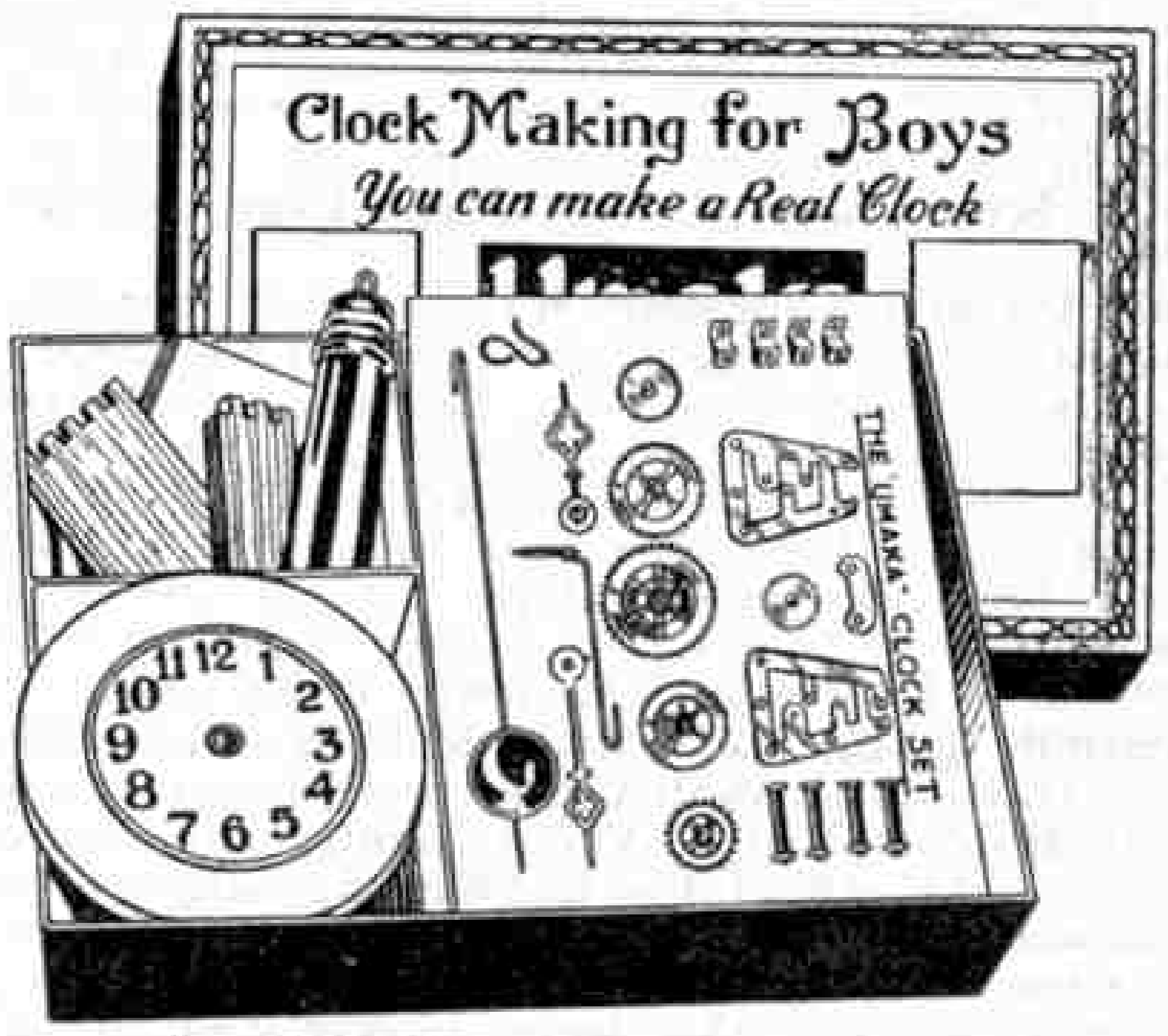
We stock all Hornby Train and Meccano Parts and send them Carriage Paid to any Station U.K.



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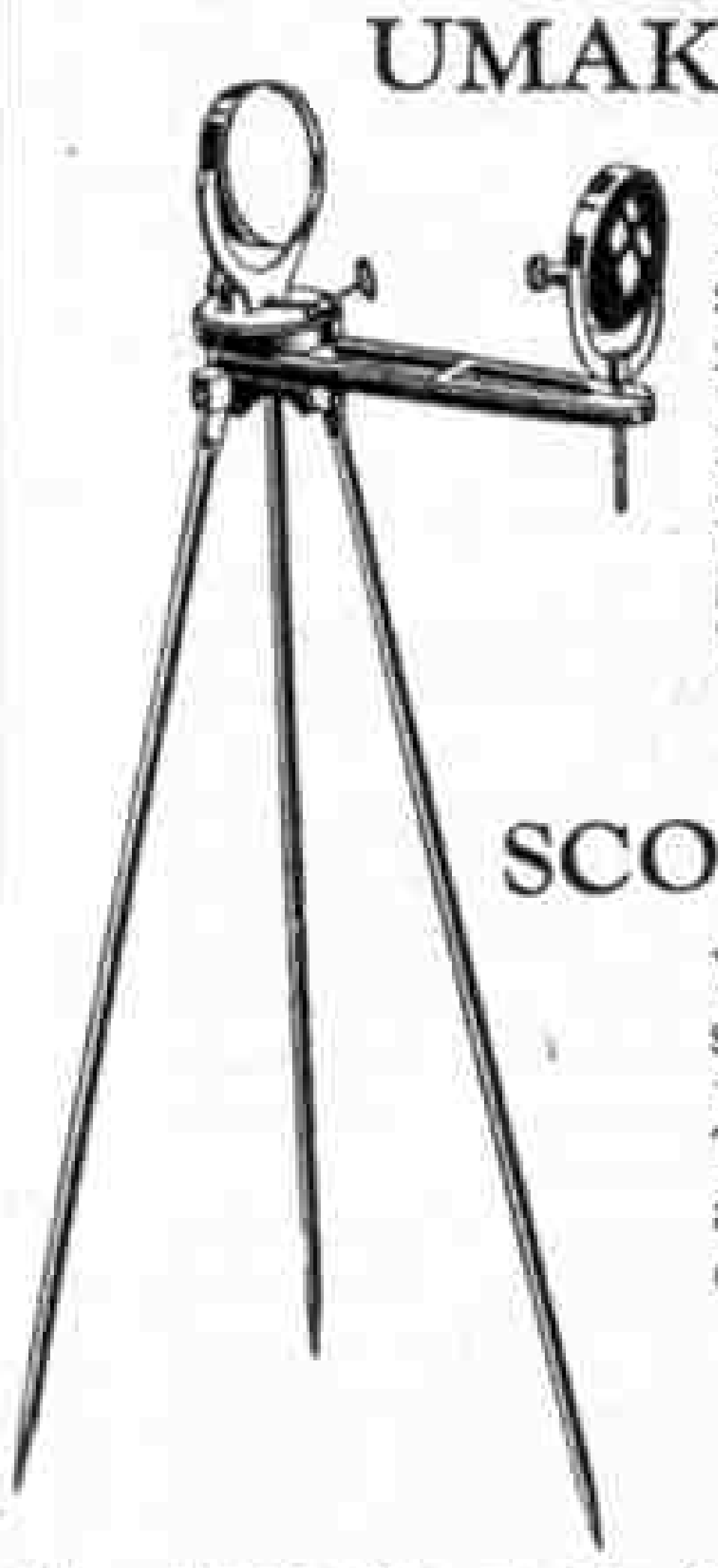

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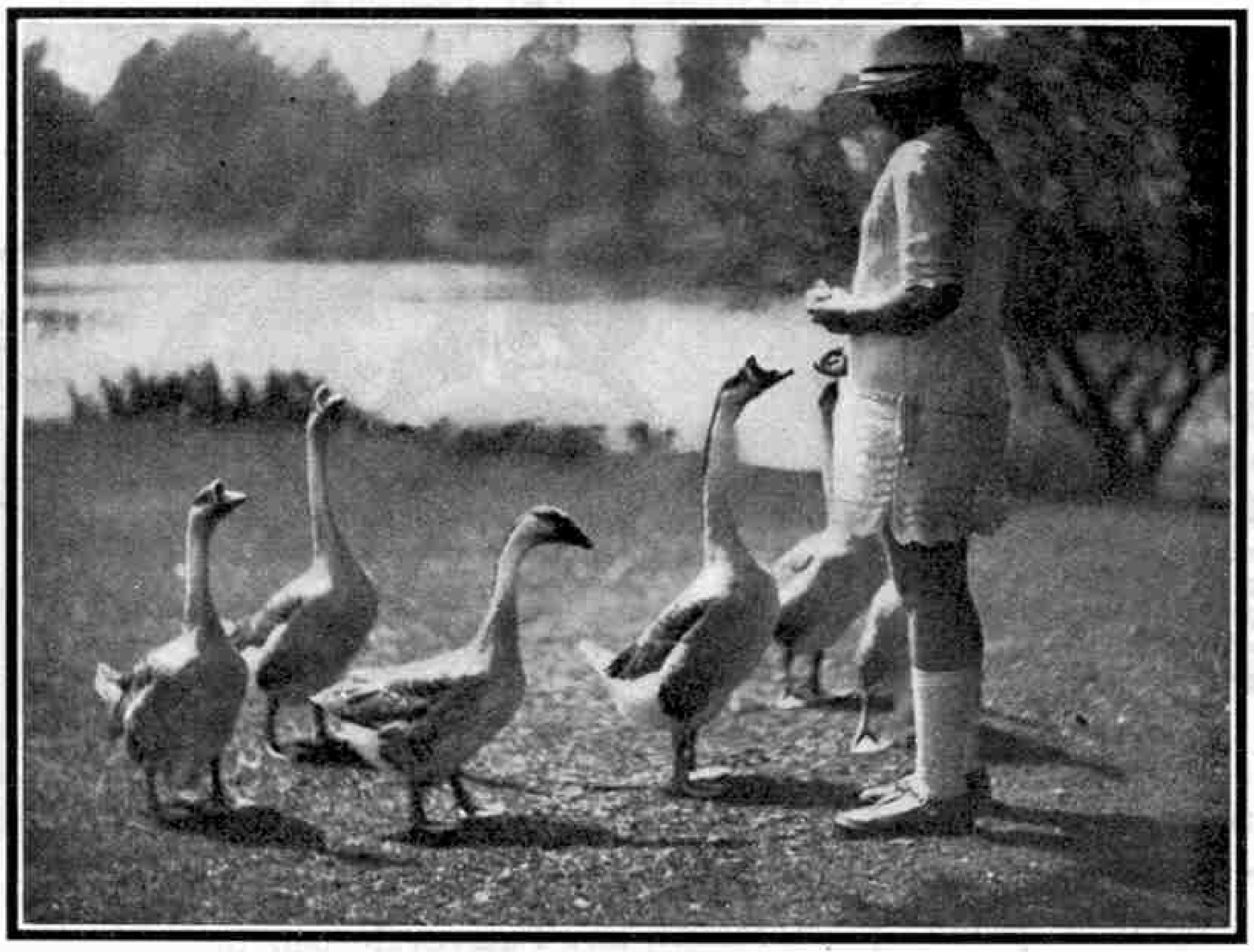
Competition Page

"IMPROBABILITIES"

A few days ago a bright young man applied to us for a junior post on the Editorial staff. It seemed he had been engaged recently on the sporting staff of a Lancashire newspaper, but had "resigned" following his Chief's refusal to publish his account of a certain football match. It was quite obvious, he asserted, that his talents were wasted on such a paper and he desired a post affording full scope for his descriptive ability and imagination!

He produced the spurned report and as we read it we realised how grave a mistake the Editor had made! The manuscript was a masterpiece—never were more errors of fact, probability and composition compressed into so small a space! As a humorous report of what did not take place it was a gem! In order that "*M.M.*" readers may amuse themselves discovering the unconscious blunders, we are reprinting as much of it as space will permit. Here it is :—



"Sharing her Lunch." **A happy picture submitted by F. G. Clements, Luton, Bedfordshire, in the 1929 Holiday Photographs Contest.**

Manchester Rovers v. Liverton United

"The long anticipated duel for the honour of winning the Amateur Football Association Shield for the season 1929/30 took place on the ground of Manchester United on Friday last, 29th February. The big ground was comfortably full, it being estimated that not less than 120,000 spectators were present when the teams turned out at 3.15 a.m. The turf was in perfect condition.

"Beckoning the rival captains to the centre, the referee tossed up and, Liverton winning, elected to play with the sun and wind. Quickly the teams lined up; Manchester were certainly the biggest side and looked fighting fit in their white jerseys and black shorts, their goalkeeper wearing green and white. The Liverton men had probably the advantage in weight, and they looked a splendid set of men in their blue jerseys and white pants, their goalkeeper turning out in a brand new white sweater.

"Even as one admired, the whistle sounded and Liverton kicked off. Swiftly the ball was slung out to the Liverton left, but the Manchester defence was alert, and as the extreme winger slipped the ball inside to his partner the Manchester left half nipped in and intercepted the pass. Down the wing he sped, beating man after man, until with the goal at his mercy he stumbled in the mud just outside the penalty area.

"Play waged keenly from end to end until 15 minutes had gone, and then a brilliant piece of dribbling took the Manchester outside right clean through the defence, and with a strong drive from an acute angle he gave Manchester the lead. It must be conceded, however, that the United's goalkeeper was blinded by the strong sunshine.

"Nettled by this reverse, the Liverton forwards stormed the Mancunian citadel. Shot after shot was delivered; uprights, crossbars and side netting were struck repeatedly. The excitement grew intense as the crowd roared encouragement to the Liverton players, urging them to greater efforts. Then fell a sudden hush! The referee was pointing to the dreaded penalty spot! A Rovers forward, in the act of shooting, had been heavily charged and brought down.

"A few moments of tense silence as the Liverton captain placed the ball and prepared for the kick. Then a roar of delight went up from 150,000 throats and 150,000 pairs of eyes as the Manchester goalkeeper brought off an impossible save. Divining the direction the ball would take, he dived a fraction of a second before the ball was kicked and turned it behind for a goalkick. . . . ."

Here, we feel, is quite enough of that! The point is: How many mistakes and improbabilities are there in this extraordinary story?

Prizes of Meccano products, to be chosen by the winners, to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the four longest lists of genuine errors.

The errors must be described briefly, using only one side of each sheet of paper. Each competitor must state at the head of his first sheet the number of errors he has found, and then forward his list to "Football Improbabilities, Meccano Magazine, Binns Road, Old Swan, Liverpool," to reach this office not later than 30th April. Overseas closing date, 31st July.

1930 Photographic Contests

For several years it has been our practice in connection with Photographic Competitions to set special subjects for each separate competition. It has been suggested to us that would-be competitors have often found themselves unable to take part, however, because circumstances have prevented them from finding subjects within the scope of the particular competition. Naturally we desire to make it easy for everyone to enter and this year our monthly competitions will not call for photographs of any special subject, but will be open for any and every type of subject.

Prizes will be offered each month for the best photographs submitted. The entries will be divided into two sections, as usual, A for those aged 16 and over, B for those under 16, and Photographic Materials or Meccano products, as desired by the winners, to the value of 21/– and 10/6, will be awarded to the best and second best entry respectively in each section each month. There will be the usual Overseas Contests, which will be treated as entirely distinct competitions with conditions and awards precisely the same as those for the Home sections.

The sole condition of entry will be that the exposure must have been made by the competitor. The developing and the printing may have been done by a professional.

Each competition will be referred to by the name of the month in which it opens. All entries for this first contest must be addressed to "April Photographic Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must reach this office not later than 30th April for the Home Contest and 31st July for the Overseas Section.

Look at this Fairycycle! With balloon pneumatic tyres; powerful brakes and glittering handlebars—what a bike! What a proud machine to ride! Fancy going out to tea on it! Fancy turning up at school on it! Fancy the other chaps crowding round! Yes, you must wangle a Fairycycle.

Every possible detail of equipment on her. Dunlop balloon tyres for solid comfort, tangent spoke wheels with glittering plated rims; bell, pump, tool bag with real tools; stand, so that she stays upright when not in use, and carrier for the mater's parcels. Moreover, any Fairycycle can be fitted with a flat plate between the saddle and the handlebars showing a realistically painted motor cycle engine! Yes, the No. 8 Fairycycle is a machine in a thousand and is so strongly built that when you are big enough to hand it on to a small brother or sister it will still be well worth handing on.

FAIRYCYCLE

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Membership free to owners of genuine Fairycycles and badge attached to every machine. Simply fill up the form when you buy your Fairycycle, post it to Lines and you will then become a member. This is the badge of the Fairycycle Association.

Fairycycles are made in the following sizes at the prices stated:

Model A.—Well finished in black cycle enamel, ball-bearing pedals and plated handlebars. Dunlop saddle, 12" tangent spoke wheels, ⅝" rubber cushion tyres - **29/6**

Model Ax.—Like Model A, but larger size, with 14" wheels and ⅝" rubber cushion tyres - **33/-**

Model B. — Very suitable for young children, being light and easy to ride. Has 12" tangent spoke wheels with ⅞" rubber tyres. Complete with chain-guard, reflector, stand and carrier **39/6**

Model Bx.—As Model B but larger size with 14" wheels and ⅞" rubber cushion tyres - **42/-**

Model C.—Raised pattern plated handlebars, has chain guard, stand, carrier, reflector and bell. Cycle pattern rim brake, 12" tangent spoke wheels, adjustable ball-bearing hubs, 1" imitation pneumatic tyres - **49/6**

Model Cx.—As Model C but larger size with 14" wheels - **52/6**

Model Px.—As Model Cx but with 14"×1⅜" Dunlop "Kempshall" pneumatic tyres - **55/-**

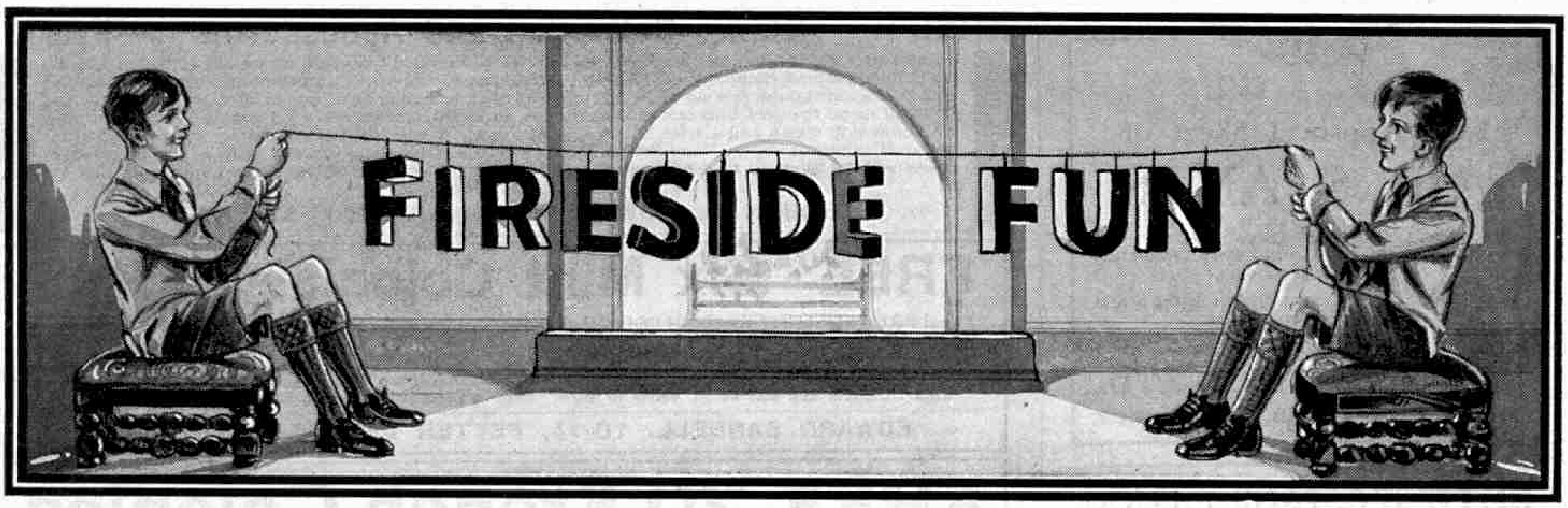
Model D.—Cycle type brakes, raised pattern plated handlebars, 2-coil spring saddle, etc. ½"×⅛" roller chain, adjustable ball bearings throughout. 12" tangent spoke wheels with 1" imitation pneumatic tyres, complete with chain-guard, stand and carrier, reflector and bell - **59/6**

Model 6.—Strongly built for children up to 9 or 10 years old. 16" tangent spoke wheels fitted 1" imitation pneumatic tyres, adjustable ball-bearings throughout, cycle pattern rim brake. Imitation pneumatic tyres, 3-coil spring saddle, tool bag, bell, etc. - **70/-**

Model 8.—The "Rolls-Royce" of Fairycycles, raised pattern plated handlebars, 2¼" buttress tread Dunlop balloon tyres. Plated ball-bearing pedals, tool bag, carrier, stand, bell, reflector and pump, etc - - **87/6**

All these Models with the exception of Models A and Ax are finished in black or blue, with gold lines. Fairycycles can be obtained at all good toy shops, or write for illustrated leaflet.

LINES BROS. LTD., MORDEN ROAD, MERTON, LONDON, S.W.19



IRREFUTABLE PROOF

The small boy went up to a man walking in the park, and, raising his hat, said politely, " Please, sir, can you tell me the right time ? "

The gentleman consulted his watch. " It's just 25 minutes past four," he said.

" Oh, it can't be that," replied the boy, " because my mother said I was to be home at four o'clock—and I'm not there yet ! "

* * * *

The boy asked the chemist's permission to use his telephone in order to call up Dr. Brown. The chemist gave the necessary permission and overheard the boy ask the doctor if he wanted a " buttons." From the rest of the conversation he gathered that the boy's luck was out and so decided to give him a trial himself.

The boy listened to the offer, and declined it with thanks as he was " already employed."

" What ! " exclaimed the chemist. " But you've just been asking Dr. Brown for a job."

" Oh, no," the lad explained. " I'm the Doctor's boy, and I just wanted to see how I stood ! "

* * * *

Brown : " I have been given to understand that you said I was dishonest."

Robinson : " I never said anything of the sort. What I did say was that if you hadn't helped me to look for that half-crown I lost the other day I might have found it."

* * * *

The farmer had only recently been elected to the school board, and was visiting the village school in his official capacity for the first time. " Now, boys, can any of you tell me what nothing is," he demanded.

After a moment's silence a small boy in a back seat stood up. " It's what you gave me the other day for holding your horse," he said.

* * * *

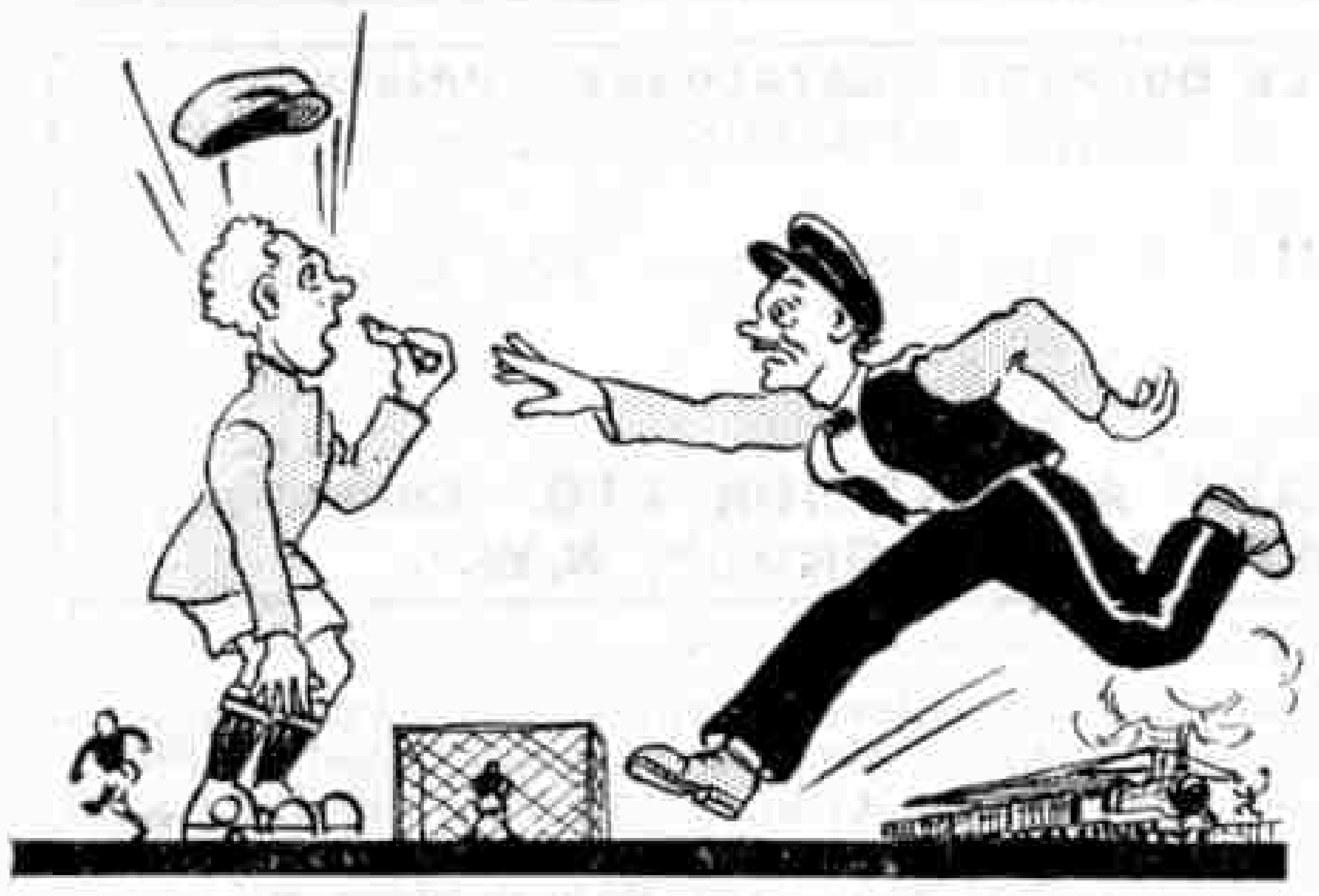
Guide : " This, ladies and gentlemen, is the room where the beautiful young countess was foully murdered."

Tourist : " But last year you said it was in the ante-room over there."

Guide : " Yes, but we can't get in there just now as it's being distempered."

* * * *

NOT HALF TIME



Railway Porter (to referee at village football match) : " Gimme back my whistle, quick. The four-ten's waiting to go out."

* * * *

Smith and Jones were going home together from the city. " By Jove, you do look unwell, old chap," said Smith. " Why don't you take a week or two off ? "

" Quite impossible," said Jones.

" Come now," pursued Smith. " Surely the firm can do without you for that short time ? "

" Granted," was the reply. " That's just the trouble. I don't want them to find out."

* * * *

The boy was applying for a job at a fishmonger's. To test his ability to do mental arithmetic, the tradesman was asking him a few questions.

" What would 20 pounds of salmon be at 3d. per pound ? " demanded the fishmonger.

" Bad ! " came the reply

HOW WAS HE TO KNOW ?

" Is defendant in the habit of talking to himself when alone ? "

" I don't know."

" Don't know ? And yet you say you are intimately acquainted with him ? "

" Yes, that's so ; but, you see, somehow or other I never happen to be with him when he is alone ! "

* * * *

Small boy (in sweet shop) : " Mother, I want some chocolates."

Mother (firmly) : " No, you don't, dear."

Boy (in a small, quavering voice) : " What kind of sweets do I want, mother ? "

* * * *

BE PREPARED !

Enterprising Insurance Agent : " It is high time you were insured against accident, sir."

Hotel Visitor : " Why ? "

Agent : " You are sitting on the local boxing champion's hat."

* * * *

New resident (to post master in city post office) : " Ah want hauf a pund o' hame."

Post master : " We don't sell ham here. This is a post office."

New resident : " Man, ye're awfie far behind the times. In the post office at Auchtermuchart, where ah com' frae, they sell hame, an' eggs, an' firelichters, an aipples, an' a' sorts o' things."

* * * *

Nobody doubted the professor's great knowledge, but unfortunately he was not possessed of the knack of passing it on in an interesting manner, and so it sometimes happened that a student would fall asleep during a lecture. One day, becoming exasperated by a particularly bad offender, he shouted : " I'll teach you, young man, to fall asleep during my lectures."

" Too late, professor," replied the undergraduate. " I've learned already."

* * * *

A preacher on looking up from the sermon he was reading was horrified to see his young son in the gallery. The boy was pelting the members of the congregation with horse-chestnuts. Seeing his father looking at him he cried out : " You go on with your preaching, daddy ; I'll keep them awake "

* * * *

Little town girl (who has spent a day in the country for the first time, having hitherto only played in parks) : " Daddy what time do they shut the country up ? "

* * * *

The newly-appointed Superintendent of a private lunatic asylum was strolling round the grounds, when he was accosted by one of the inmates.

" Excuse me, sir," he said, raising a top hat, " but I have great pleasure in informing you that I and all my colleagues like you much better than the last governor we had."

" Thank you," said the new Superintendent beaming. " And may I ask why ? "

" Well, sir," answered the lunatic, " you seem much more like one of ourselves."

THE ONLY WAY

Small Boy : " Can I get up at four o'clock to-morrow morning, please, mother ? "

Mother : " Good gracious, dear, why ? "

Little Boy : " Because I want to play with my engine before daddy gets up."

* * * *

" Call yourself a typist," fumed her employer, " and can't fix a ribbon on the machine ? "

" Well," she demanded haughtily, " does Paderewski tune his own piano ? "

* * * *

Customer : " How much are your sultanas, please ? "

Shop assistant (under notice of dismissal) : " Sevenpence and ninepence a pound."

Customer : " What is the difference ? "

Shop assistant : " Twopence, madam."

* * * *

" Well, Johnnie," said the vicar to a little fellow aged six. " I hear you are going to school now."

" Yes, sir," was the reply.

" Well now, what part of it do you like best ? " asked the good man.

" Coming home, sir ! "

* * * *

" I left school believing that the world had an opening for me."

" And have you found it yet ? "

" Oh, yes, I'm in an awful hole just now."

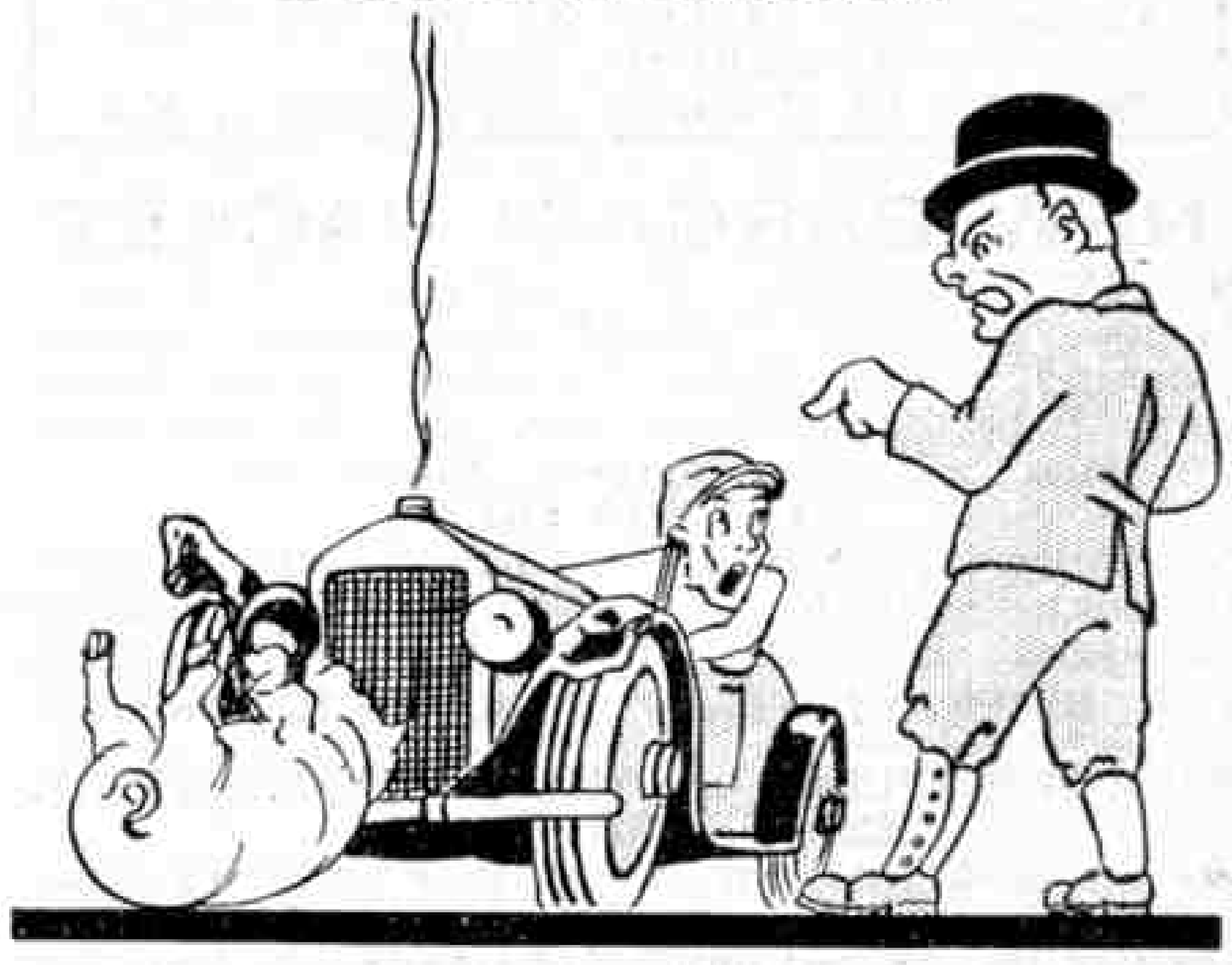
* * * *

The recently engaged traveller had boasted that he was the greatest salesman in the world. Consequently his employers expected results, and when the new man had been on the road for five weeks without securing a single order, it was decided that an explanation should be demanded.

The following day the sales manager was surprised to receive the following telegram : " I am not the greatest salesman in the world, I am the second best. The greatest salesman was the man who loaded you up with these goods ! "

* * * *

A LEAN EXCHANGE



The motorist had killed one of the farmer's pigs, and was being soundly rated for his carelessness.

" Don't worry—I will replace the animal," he said in reply to the farmer's vituperations.

" That won't do," said the farmer, " you're not half fat enough."

* * * *

Two golfers who were playing an important tie, were greatly annoyed by a slow and obviously raw couple in front of them.

At one hole there was a particularly long wait. One of the offending couple dawdled on the fairway while his companion searched industriously in the rough. At length the waiting pair on the tee could contain their impatience no longer.

" Why don't you help your friend to find his ball ? " one shouted indignantly.

The idle golfer in front turned with a cheerful smile. " Oh, he's got his ball all right," he replied blandly. " He's looking for his club."

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Chetwynd, Shanklin Drive, Westcliff-on-Sea.

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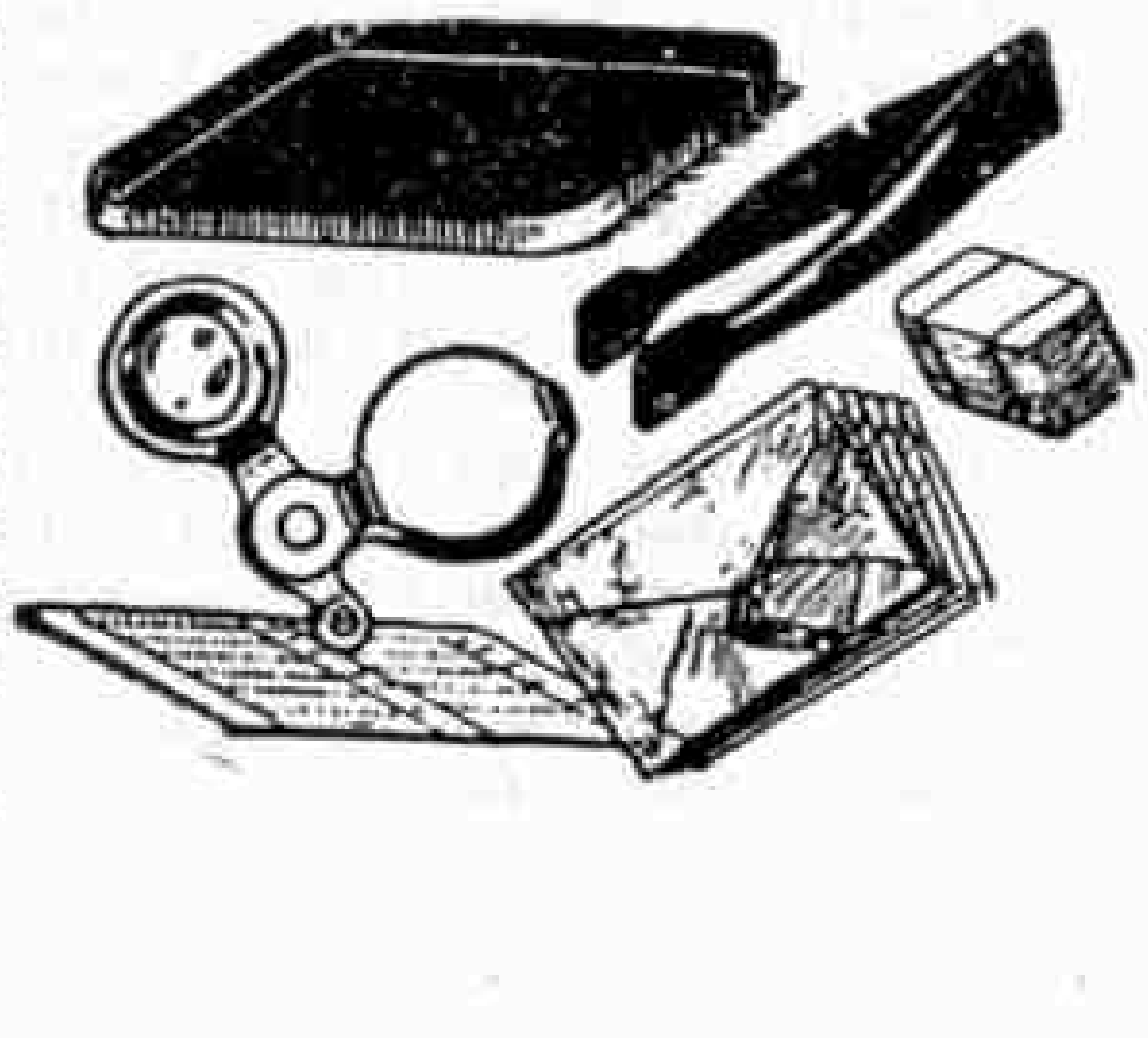
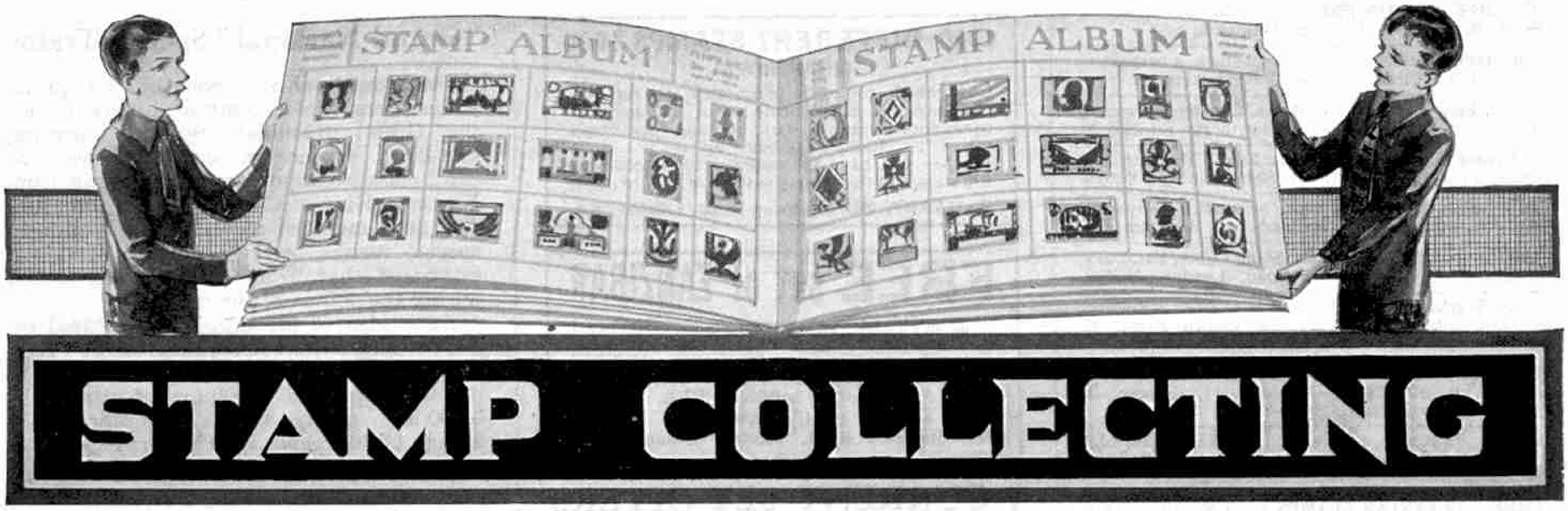


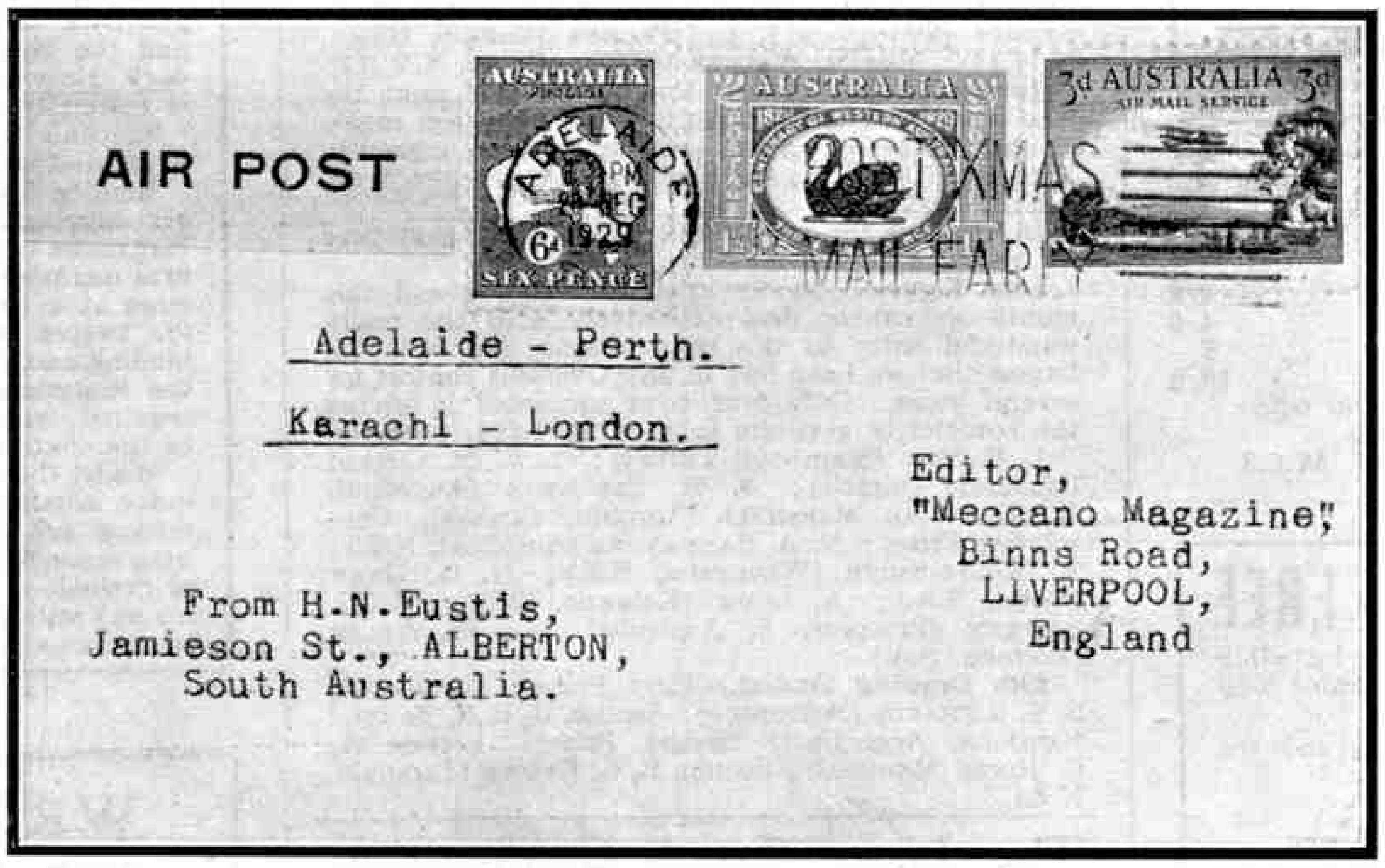


STAMP COLLECTING

THE AIR MAILS OF AUSTRALIA

IN the course of his Australian tour in 1926, Sir Alan Cobham, Britain's great air pioneer, declared that Australia was a natural aerodrome, an ideal flying country. His words created a great impression and gave a great stimulus to flying in the Southern Continent. Private flying clubs and civil aircraft operating companies immediately began to spring up. Few of these have looked back since and every succeeding year has seen great progress. To-day air routes are being experimented with in almost every part of the country, and the next few years will see some revolutionary changes in Australian light transport methods, particularly in the up-country areas.

The three principal operating companies are West Australian Airways; Queensland and Northern Territory Aerial Services, popularly known as "Quantas"; and the Larkin Aircraft Supply Company. These are comparatively old-established concerns, and between them have a virtual monopoly of the mail carrying contracts. A new company, to be called Australian National Airways, is in process of formation, however, to operate a service between Melbourne, Canberra, Brisbane and Albury.



AIR POST

Adelaide - Perth.

Karachi - London.

Editor,
"Meccano Magazine",
Binns Road,
LIVERPOOL,
England

From H.N.Eustis,
Jamieson St., ALBERTON,
South Australia.

Our illustration shows a flown cover from the recently inaugurated Australian link with the Karachi-London air service, referred to in the accompanying article.

The oldest regular mail and passenger service is operated by West Australian Airways, under Government subsidy, between Perth and Derby, West Australia, a distance of 1,442 miles. This route was established in 1921, and, in June, 1929, it was extended from Perth to Adelaide, South Australia, making a total route length of 3,000 miles. A weekly service is maintained in each direction, with D.H. "Hercules" machines on the Perth-Adelaide section and D.H. 50's on the Derby-Perth section. The value of the work performed over these routes is clearly shown by the fact that up to 30th June last, more than 1½ million miles had been flown, and nearly 1½ millions of letters and packets had been carried, in addition to 20,000 passengers.

The "Quantas" route between Charleville and Normanton, Queensland, 1,025 miles, is next in seniority. This was opened in November, 1922, between Charleville and Cloncurry, 577 miles, but was extended to Normanton subsequently. "Quantas" have a more important route in the weekly Brisbane-Charleville-Camooweal service, which gives a through link with Brisbane for the residents of the farming and mining areas in the extreme North and North West Territories. During the year ended 30th June, 1929, "Quantas" carried nearly 40,000 letter and parcel packets, in addition to 30,000 lb. of freight, the mileage flown during the year being more than 250,000 miles.

The Larkin Company's most important mail service is between Adelaide and Cootamundra, a distance of 580 miles. From June, 1924, to July, 1925, this service was flown right through to Sydney, but the existence of a good night train service from Cootamundra to Sydney led to the abandonment of the Cootamundra-Sydney section. The Larkin Company also operates branch services from Broken Hill to Mildura, N.S.W., and from Melbourne, Victoria, to Hay, N.S.W.

The popularity of air transport in Australia is quickly made clear by the fact that although operations on anything but an experimental scale are only of comparatively recent date, yet, up to 30th June, 1929, 1,676,933 pieces of mail matter had been carried. During April, 1929, 54,653 miles were flown on regular air routes, while during the 14 months ending 31st May, 458 Pilot's Licenses and 27 aerodrome permits were issued.

Air mail developments in the closing months of 1929 and the early days of 1930 have been almost amazing. Most important of all is the establishment of a link with the Karachi-London service. Inaugurated in early December, this service employs a combination of all types of transport in making its connections. The mails are taken by train or air from all parts of Australia to Adelaide or Perth, whichever is the more convenient. Those collected at Adelaide are carried by air to Perth to connect with the mail steamer to Colombo. Between Colombo and Karachi, motor cars, ferry steamers, and mail trains are employed to link up with the Karachi-London service. The ultimate outcome is a reduction of the mail transit time between Australia and England of rather more than a week as compared with the ordinary steamer service. The flown cover shown in our illustration is from one of the earliest flights of this service. It was posted in Adelaide on 20th December and actually was on the Editor's desk on 16th January.

Another new service was opened on 4th February between Melbourne and Adelaide to link Victoria with the Adelaide-Perth-Derby service. Specimen covers from this route were not to hand when this article went to press, but we hope to be able to illustrate specimens from the first flight in an early issue. Brisbane and Sydney also have been linked up by a new service, and an Australian correspondent, Mr. Colin B. Phillips, tells us that Mr. Kingsford Smith, the famous Australian pilot, contemplates opening in the near future a service to link up Brisbane, Queensland, with Hobart, Tasmania, via Sydney and the Bass Strait.

Australia has been singularly fortunate in possessing Lord Stonehaven, a qualified airman, as Governor-General during the early stages of the country's aeronautical development. Lord Stonehaven, whose interest in aviation has given so strong a fillip to Australian flying, prior to his elevation to the peerage was Sir John Lawrence Baird, P.C., G.C.M.G., D.S.O., and served in 1916 as Vice-President of the Air Council. Subsequently, on the formation of the Royal Air Force, he became Under-Secretary of State for Air.

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ON APPROVAL

from which you may select any 100 for 3/–. This selection is **not** made up of the thousand commonest stamps, but contains specimens priced by Stanley Gibbons up to 1/– each. For 3/– you have the opportunity of choosing 100 stamps of the catalogue value of 20/– or more.

H. HARDY, 285, Archway Road, London, N.6.

FREE set of ZANZIBAR

to all applicants for my approvals of BRITISH COLONIALS, King's Heads and beautiful pictorials, many rare at BARGAIN PRICES. **SPECIAL OFFER**—120 French Colonials, all different, 1/2 POST FREE.

C. H. SHAW,
94a, Stapleton Road, Tooting, London, S.W.

7 CURRENT SET OFFERS

All in splendid used condition. Postage extra. **Ceylon** (16) 1c. to 1r. only 2/6 ; **Canada** (11) 1c. to $1 only 2/6 ; **India** (14) 3p. to 1r. only 10d. ; **Ireland** (12) ½d. to 1/– only 10½d. ; **Kenya** and **Uganda** (11) 1c. to 1/– only 2/– ; **China** (19) ½d. to $1 only 1/6 ; **Straits Settlements** (16) 1c. to $1 only 2/3. Satisfaction Guaranteed. All subject to being unsold, as my set offers are very popular. Order Now. My monthly list of fine offers is post free on request.

GEORGE LAZENBY, 16, Redburn Drive, Shipley, Yorks.

COMPETITION RESULTS

Cover Voting Contest.—1. R. E. Leat (Totterdown, Bristol) ; 2. E. Bamforth (Lincoln) ; 3. R. J. Renyard (Lewisham, S.E.13) ; 4. A. M. Denton (Lincoln's Inn, W.C.2). Consolation Prizes: H. Barrfield (Plymouth) ; V. W. Bennett (Heywood, Lancs.) ; S. Gauld (Golders Green, N.W.11) ; J. B. Pinnock (Bedford) ; H. J. Platt (Aldershot) ; L. Poore (Wrotham, Kent) ; W. J. Sharler (Cromer) ; R. L. Stubbs (Sydenham) ; D. Walker (Golders Green, N.W.11) ; Miss M. Walker (Golders Green, N.W.11).

Jungle Escape.—At the time of going to press the final awards in this competition had not been made, as the number of entries and the amazing ingenuity of many of them has made the judging an exceedingly difficult task.

It is hoped the results will be ready in good time for inclusion in the May issue.

Loco Figures.—In the space at our disposal this month we cannot deal extensively with the really wonderful entry to this competition. This was the largest that we have had in any Overseas contest for several years. Only four boys succeeded in giving the completely accurate solution of 1,224, however. 1. V. Bey (Stamboul, Turkey) ; 2. E. M. Cleland (Meaford, Ontario) ; 3. R. Clouston (Auckland, N.Z.) ; 4. G. Marshall (Toronto, Canada). Consolation Prizes: N. A. Bannatyne (Auckland, N.Z.) ; A. Rolfe-Smith (Whangarei, N.Z.) ; H. G. Gray (Natal, S.A.) ; A. Cook (Kelowna, B.C.) ; J. G. Sweeny (Prospect, S. Australia) ; C. S. Welsh (Pretoria, S.A.).

29th Drawing Contest.—First Prizes: Section A, S. T. Richards (Melbourne) ; Section B, E. S. Baxter (Cordoba, Argentina). Second Prizes: Section A, G. Jones (Montreal) ; Section B, G. Brown (Taranaki, N.Z.).

The Lister Truck Competition

We wish to remind Meccano boys that R. A. Lister & Co. Ltd. are offering splendid prizes for the best Meccano models of the petrol-driven "Auto-truck" that they manufacture for use in engineering works, warehouses, etc. Full particulars of the competition were announced last month, together with a description and illustrations of three different kinds of Lister Auto-truck. All that you have to do is to build a Meccano model of one of these trucks and then send a photograph or drawing of it to "Lister Truck Competition," Meccano Ltd., Old Swan, Liverpool. Entries from boys residing in the British Isles must be received not later than 30th April, while entries from Overseas competitors must arrive not later than 31st July.

The competition will be judged jointly by R. A. Lister & Co. Ltd. and Meccano Ltd., and the principal prizes in each of the three Sections in which the entries will be divided are as follows: First Prize, £3-3s.; Second Prize, £2-2s.; Third Prize, £1-1s.; Six Prizes, each of 10/6.

"Grand National" Special Trains

On 28th March no fewer than 63 special trains were run to Aintree, Liverpool, for the Grand National. Specials carrying first-class passengers only, as well as third-class excursion trains, were run from Euston, King's Cross and Paddington. The fares included meals on the train and special menus were arranged, it being estimated that 27,000 meals were served during the course of the day.

Some idea of the supplies purchased by the catering departments may be gathered from the following requisition:—2,800 pairs of slip soles, 4,000 lbs. of other fish, 6,800 lbs. meat, 420 lbs. sausages, 170 hams, 11,000 eggs, one ton rashers, and four tons potatoes.

BINDING THE "*M.M.*"

Binding cases for back numbers of the Magazine may be obtained from Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These are supplied in two sizes (1) for six copies price 3/6 and (2) for twelve copies price 5/3, post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown here. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding 6 or 12 copies. These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

WRITING PADS

FOR MECCANO BOYS

These Writing Pads are becoming increasingly popular and most of the letters we receive from Meccano boys are written on the familiar tinted paper. The pads are supplied in two sizes, each consisting of 50 sheets of tinted bank paper, with cover. They are just the thing to use when writing to your friends, for the special notepaper shows that you are a Meccano boy.

Prices—Large, 1/– each (post free); Small, 6d. each (post free).

Meccano Ltd., Binns Road, Old Swan, Liverpool.

Stamp Gossip

An Interesting Postal Decree

The Postmaster-General's recent announcement that all postage stamps of King Edward VII's reign would become invalid for postal purposes at the end of last month, is only the third decree of its kind in the history of the British Post Office. Incidentally it will help to remove an impression that exists in many quarters that some of the Queen Victoria issues are still usable.

The first notice of demonetisation—as the process of invalidating the stamps is termed—was given in the London Gazette on 19th April, 1901, and terminated the use of most Victorian issues other than those then current. Certain issues were overlooked in framing the notice, but they were covered by a general decree issued in June, 1915, demonetising all stamps of Queen Victoria's reign.

Although the King Edward issues now pass out of postal use the Post Office will exchange such issues for new at face value at any time within six months following demonetisation.

Belgian Charity Issue

Considerations of space have prevented us from reproducing in previous issues specimens from the Belgian Christmas, 1929, Anti-Tuberculosis issue, but the outstanding beauty of the stamps makes them of interest even at this late stage.

From a British point of view the 35c. + 10c. stamp, illustrated here, is the plum of the issue. Coloured green, this stamp shows the great British War Memorial at the Menin Gate at Ypres. The 1f.75 + 25c. issue is easily the next most interesting stamp. As our reproduction shows, it is one of the finest shipping views ever shown on a postage stamp, and appropriately enough, it is coloured blue.

The remaining stamps of the set are devoted to the illustration of famous beauty spots of Belgium as follows:—50c. + 5c., sepia, Waterfall at Coo; 25c. + 15c., slate, Bayard Rock, Dinant; 60c. + 15c., deep lake, Promenade d'Orleans, Spa; and 5f. + 5f., purple, The Canal and Belfry, Bruges. The set is recess printed.

Postal Congress Souvenirs, 1929

Any stamp collector would give a considerable sum for the privilege of being appointed a delegate to one of the Congresses of the Universal Postal Union, which are held at intervals of five years in one or other of the European capitals, says "*Gibbons' Stamp Monthly,*" for it has now become customary for most of the countries represented at the Congress to make gifts of stamps to all the delegates. Some countries include obsolete stamps from sheets preserved for record purposes, while others are content to give stamps of their current issues only.

On the delegates at last year's London Congress there has descended a flood of gifts almost overwhelming in its lavishness, for over fifty countries or groups have made presentations, some of which were very attractive.

Great Britain, as the hostess to the Congress, naturally gave a good lead, her gift to each delegate including a complete mint set of the current Congress stamps, together with current sets of many of the Crown Colonies and Dependencies, up to and including the 10/- value where such denomination existed. The handsomely bound volume that housed the sets was rather marred by the slipshod manner in which the transparent retaining slips were attached to the leaves.

Apart from this volume, the Empire was represented by minor gifts from Australia (values to £2, cancelled), Sudan (current unused), New Zealand and India (current unused).

A feature of the souvenirs was the widely different manner in which they were prepared. Some countries spared no pains to produce a handsome book with beautifully arranged stamps. Others were content with cards or folders of varying degrees of finish, while in some cases the stamps were thrown haphazard into an envelope, without any care or system whatever.

In the matter of the stamps themselves, the gifts were rarely otherwise than on a generous scale. Switzerland, for example, gave a complete set of the Pro Juventute issues, a handsome gift.

Altogether, the Congress Souvenirs were most interesting, not only from the collector's point of view, but as showing the different ways in which the postal authorities in the various countries deal with these opportunities for official presentations.

The New Liechtenstein Issue

Among the most beautiful of recent issues a high place must be given to the set issued in December last by the tiny principality of Liechtenstein.

Consisting of four issues with denominations of 10, 20, 30 and 70r., the stamps are in photogravure, and show portraits of the new ruler, Prince Francis I, and his consort. The Prince succeeded to the throne last year, on the death of his brother Johann, who was in his 89th year and had reigned for more than 70 years! On the 20r. and 10r. values respectively Prince Francis is shown as he is to-day, a man of 70, and as a boy, some 60 years ago. A portrait of the Prince's Consort appears on the 30r., while the 70r. is used for a composite picture of the Prince and his Consort.

The set was printed in photogravure at the Austrian State Printing Works, Vienna. It is perforated 11½ but there is no watermark.

* * * *

Our heading illustrations this month show the current South African 2d. issue, illustrating the Government Buildings at Cape Town, and the 5 markka denomination from Finland's new series, showing the famous old castle of Nyslott.

The Sturt Commemorative

By courtesy of Mr. Colin B. Phillips, of Bendigo, Victoria, we are now able to give further details of the Australian stamp that will be issued this month to celebrate the centenary of the exploration of the Murray River by Captain Charles Sturt. There will be two denominations of the stamp—1½d. and 3d. The 1½d. issue will be red and the 3d. issue blue. The central feature of the design is the head of Captain Sturt, and below it is a boomerang and the words, "Sturt, Explorer, Centenary, 1830-1930." On either side are the feathers of the lyre bird and representations of tools and weapons used by the Murray River blacks. We hope to illustrate this stamp in an early issue.

HORNBY SERIES GAUGE 0

HORNBY ROLLING STOCK

Hornby Rolling Stock includes almost every type in use on the big railways, and a selection of the splendid range available is illustrated on this page. The various items are modelled on realistic lines and are beautifully enamelled, mostly in the correct colours of the L.N.E., L.M.S., G.W. or Southern Railways.

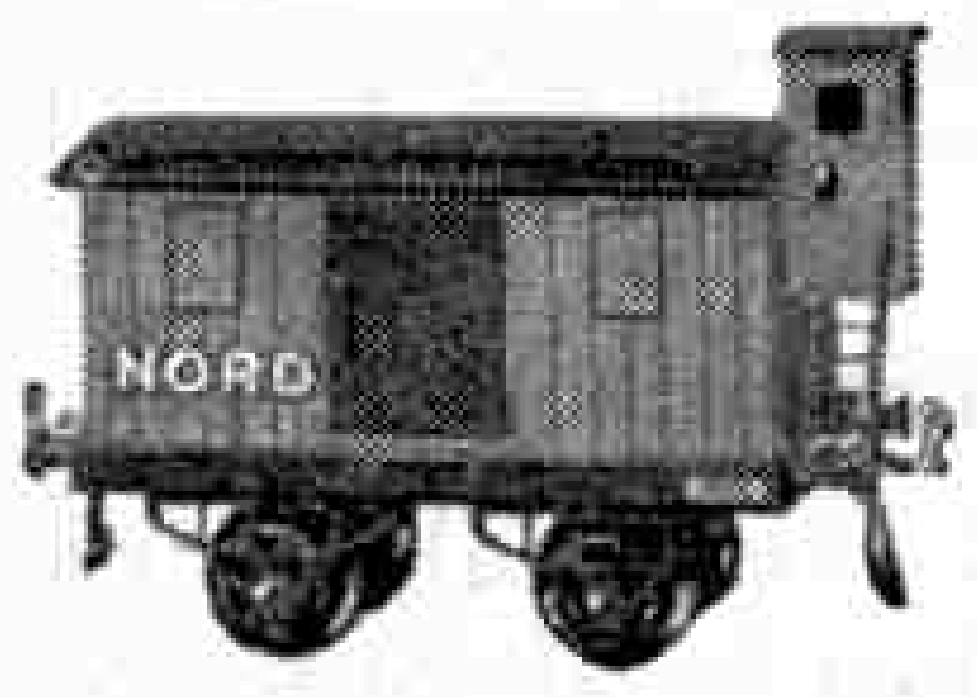
Ask your dealer to show you the full range of Hornby Rolling Stock.

PETROL TANK WAGON "PRATTS"
Finished in green.
Price 2/6

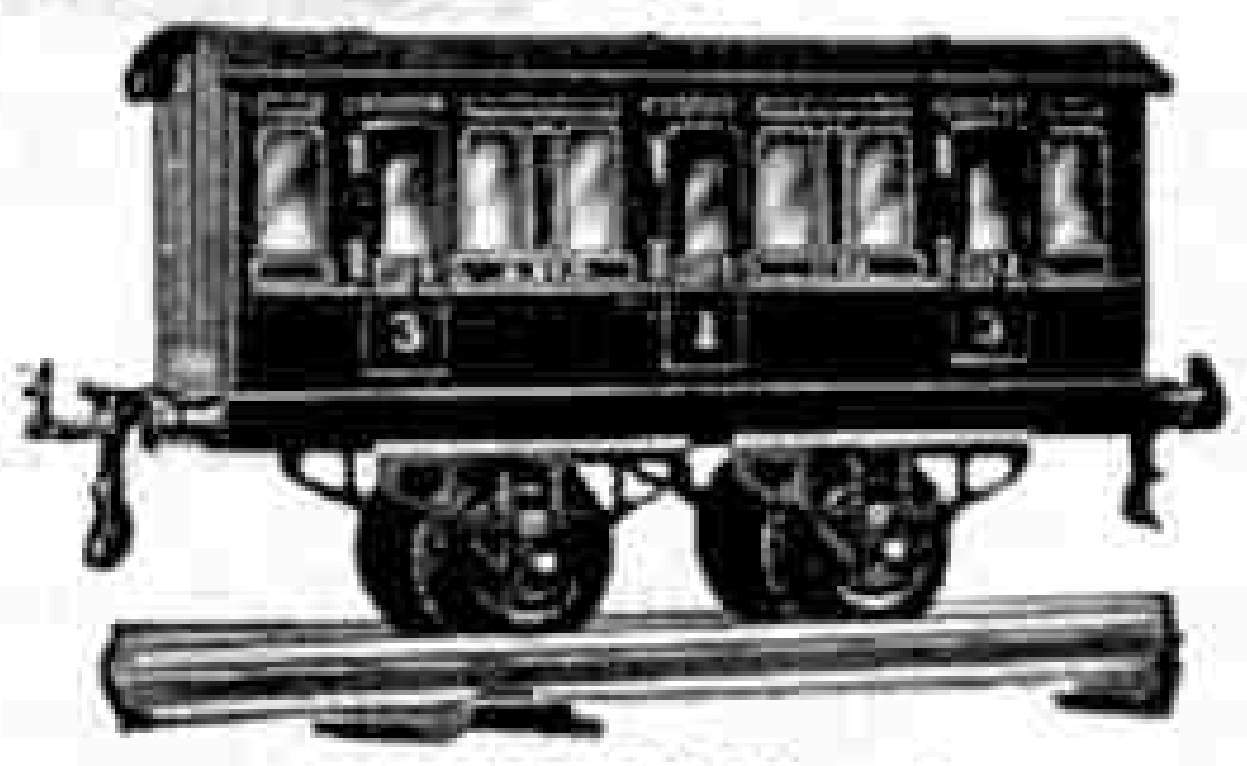
MOTOR SPIRIT TANK WAGON "B.P."
Finished in yellow.
Price 2/6

PETROL TANK WAGON "SHELL"
Finished in red.
Price 2/6

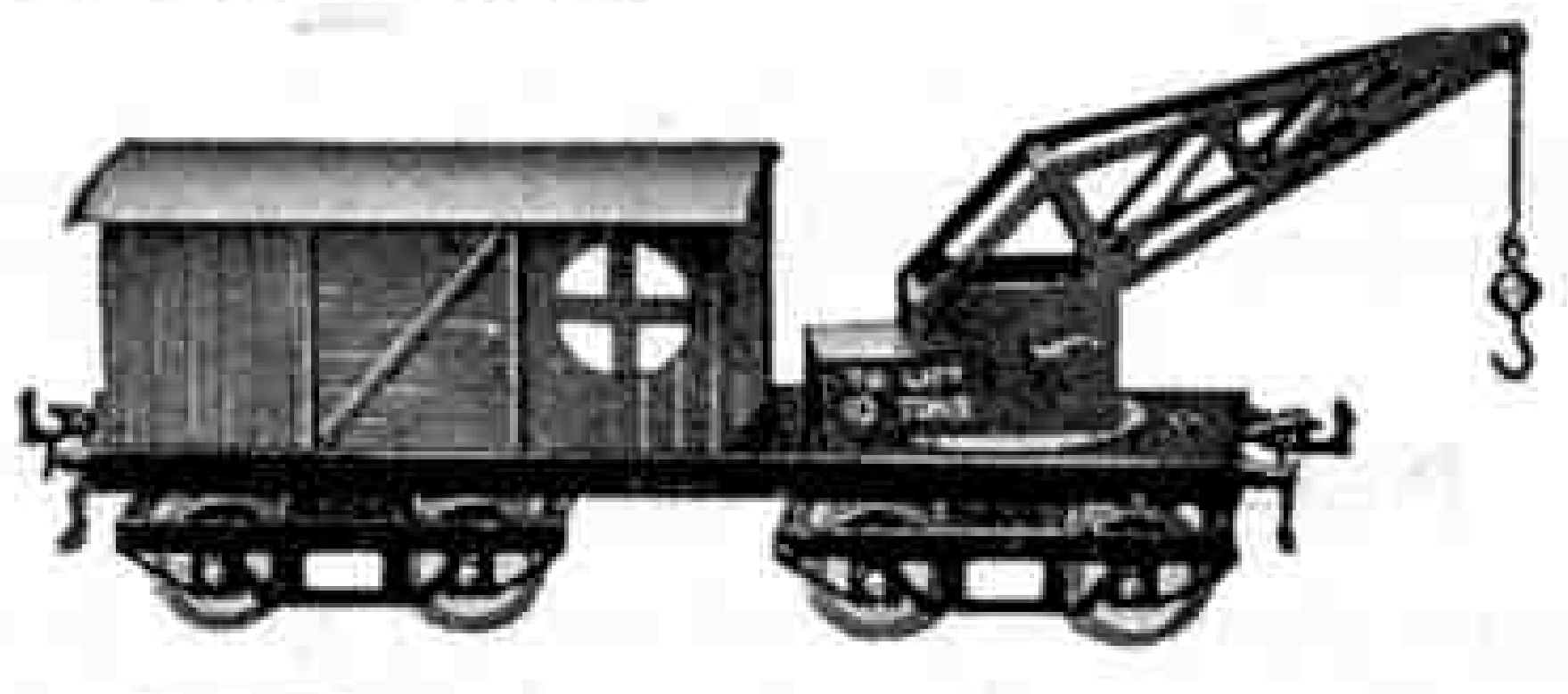
PETROL TANK WAGON "REDLINE"
Finished in blue and red.
Price 2/6



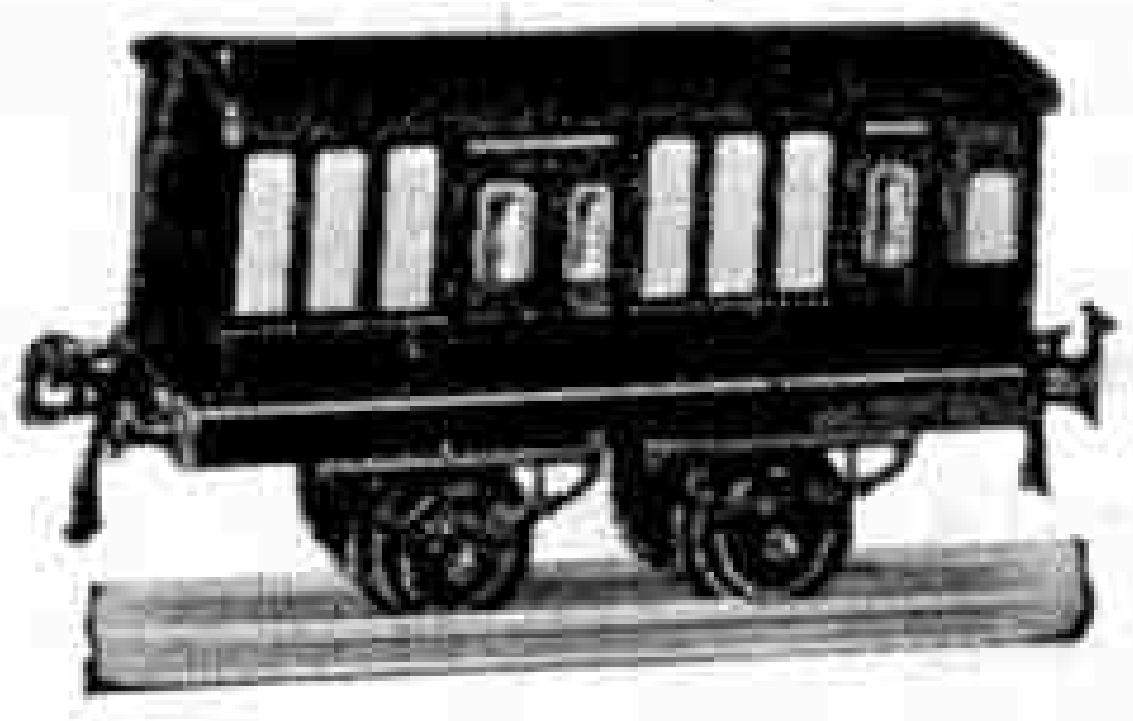
BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price 4/-



***HORNBY No. 1 PASSENGER COACH**
Realistic in design and fitted each side with opening doors. Price 2/6

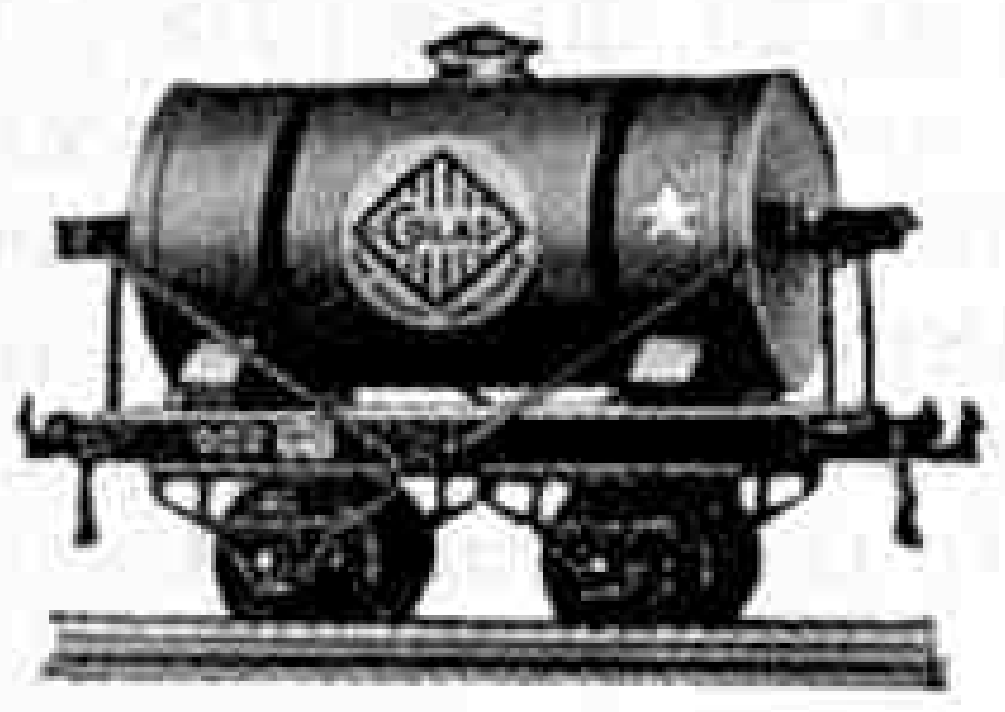


***BREAKDOWN VAN AND CRANE**
Beautifully coloured in brown and blue, with opening doors. Suitable for 2-ft. radius rails only. Price 6/3



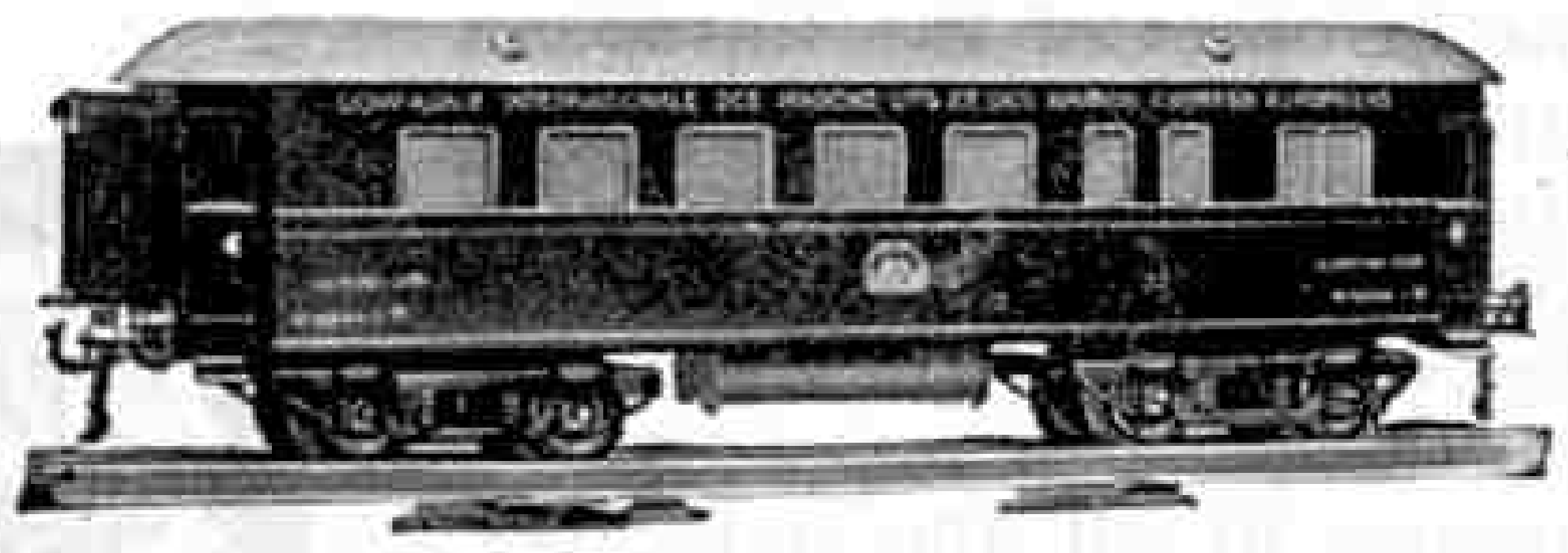
GUARD'S VAN
Realistic design, fitted each side with opening doors. Obtainable in L.N.E.R., L.M.S., G.W. or S.R. colours.
Price 3/-

WAGON (French Type)
Lettered "Nord."
Highly finished in colours. Price 3/3

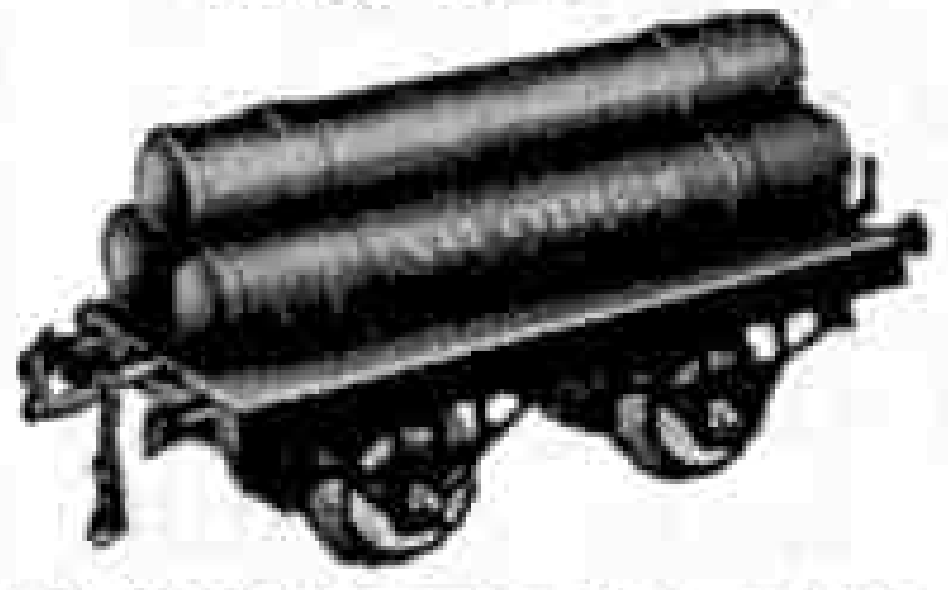


BITUMEN TANK WAGON "COLAS"
Finished in blue.
Price 5/3

ROTARY TIPPING WAGON
Finished in orange. Price 3/-



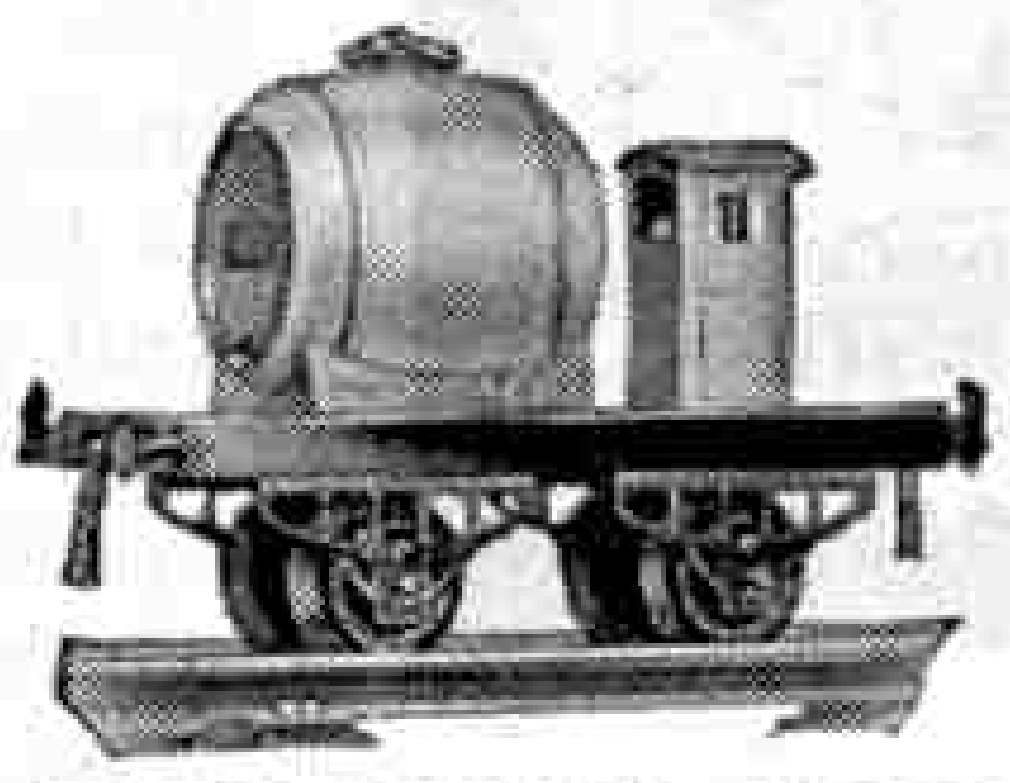
RIVIERA "BLUE" TRAIN COACH
"Dining" or "Sleeping."
This is a beautiful model, substantially built and well finished. Suitable for 2-ft. radius rails only.
Price 14/-



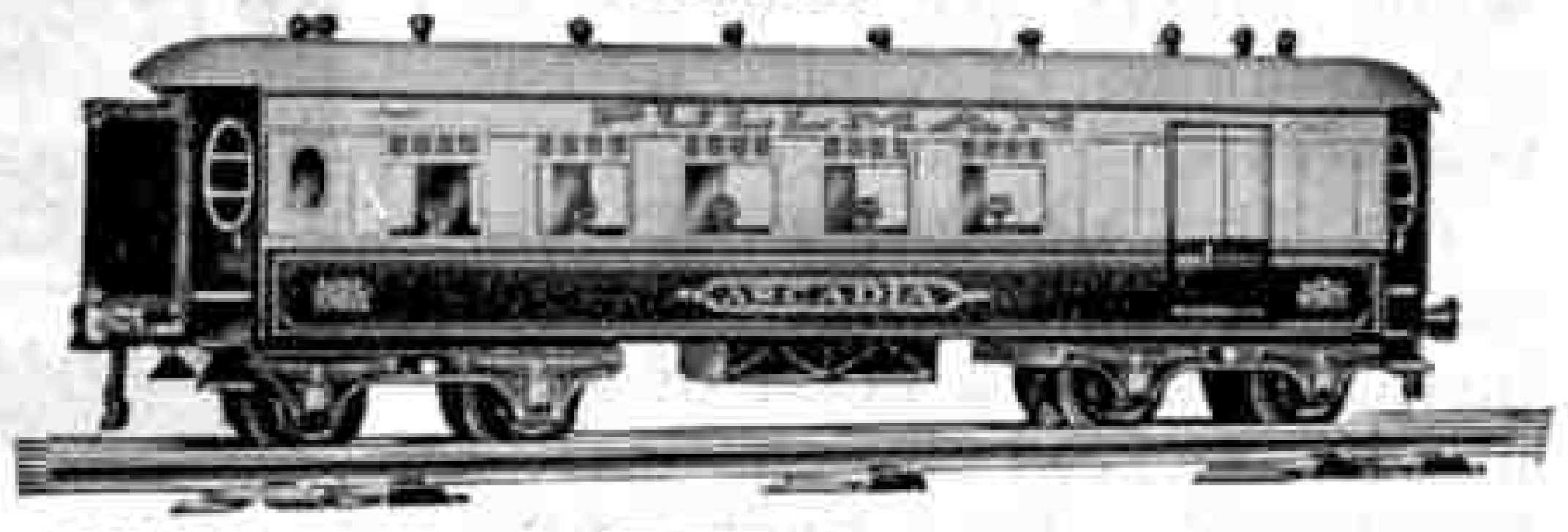
***GAS CYLINDER WAGON**
Finished in red, lettered gold. Price 2/6

MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price 6/-

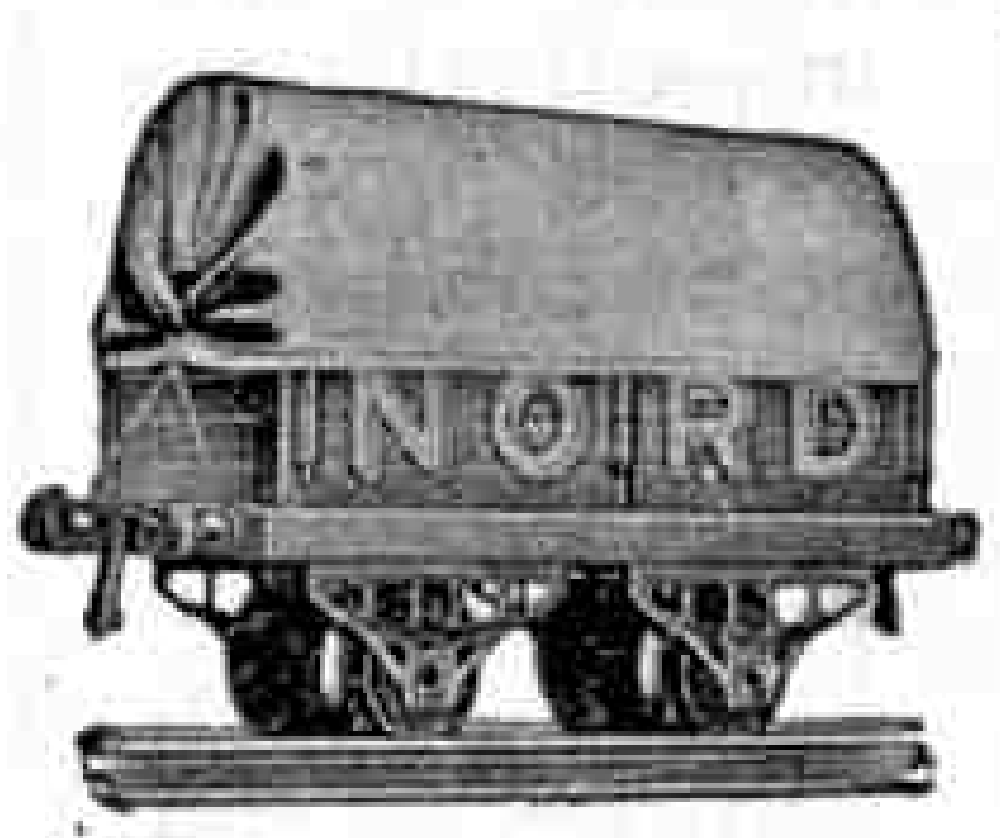
SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price 2/6



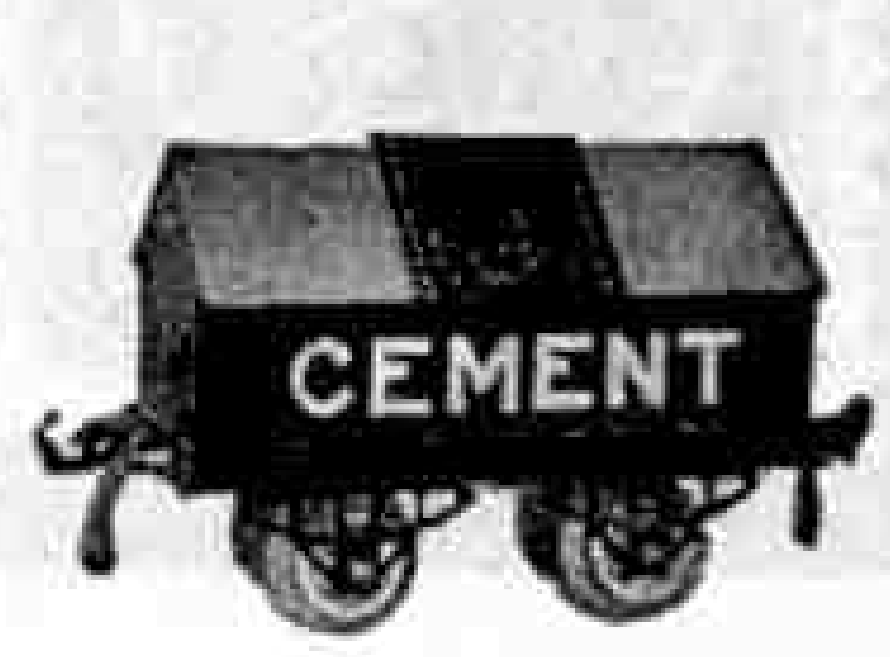
WINE WAGON, SINGLE BARREL
An interesting model of the single-barrel type of wine wagon used in France. Finished in red and green.
Price 4/-



HORNBY No. 2 SPECIAL PULLMAN COACH COMPOSITE
As supplied with No. 2 Special and No. 3 Pullman Train Sets. One part is designed for passenger accommodation and the other for conveyance of luggage. Suitable for 2-ft. radius rails only.
Price 16/-

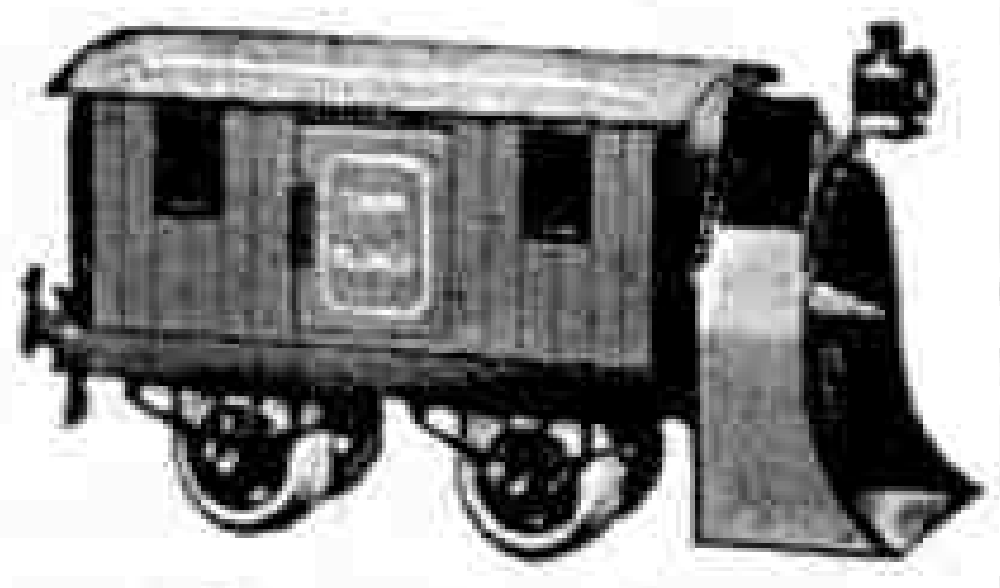


COVERED WAGON (French Type)
This new wagon is fitted with frame and sheet. French type, lettered "Nord." Price 3/-

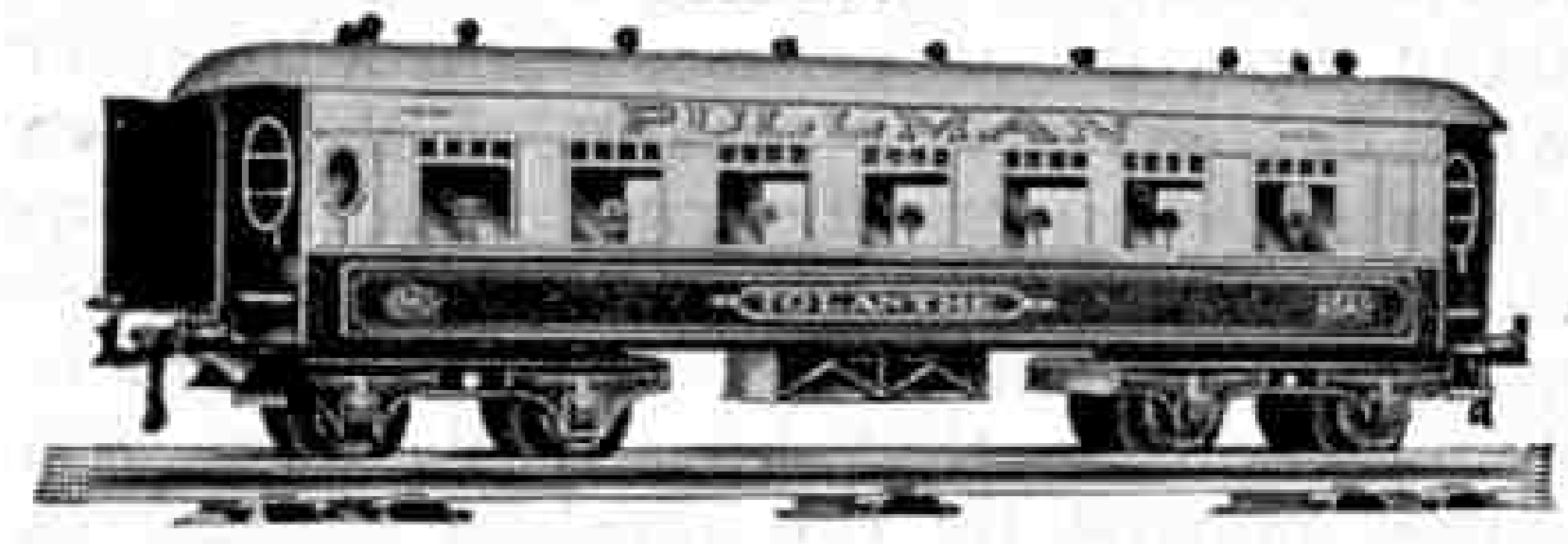


***CEMENT WAGON**
Finished in red.
Price 3/-

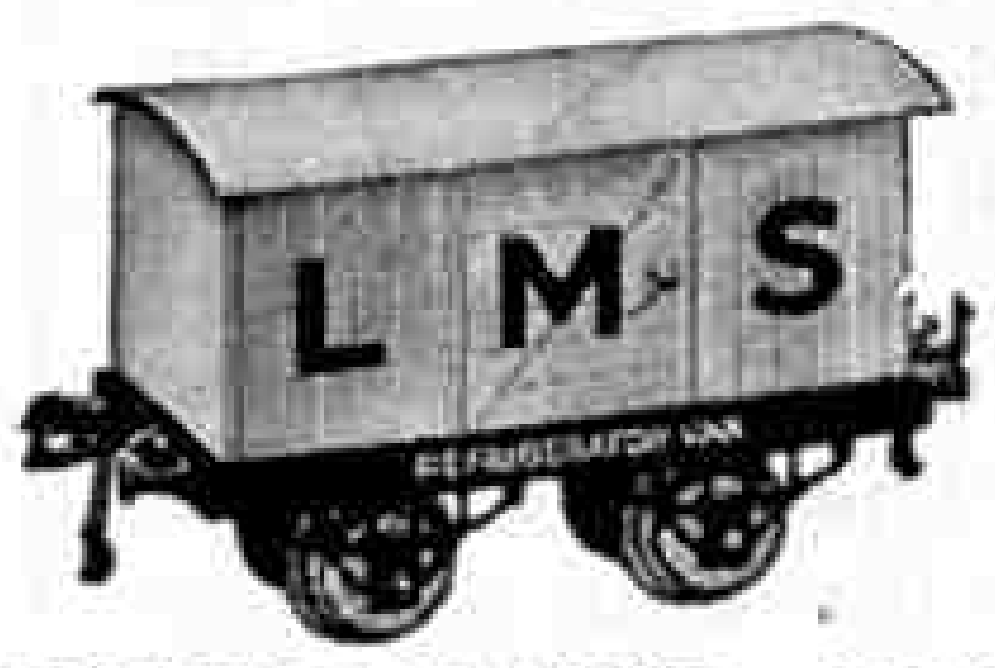
***TIMBER WAGON No. 1**
Beautifully enamelled in green and red. Price 1/9



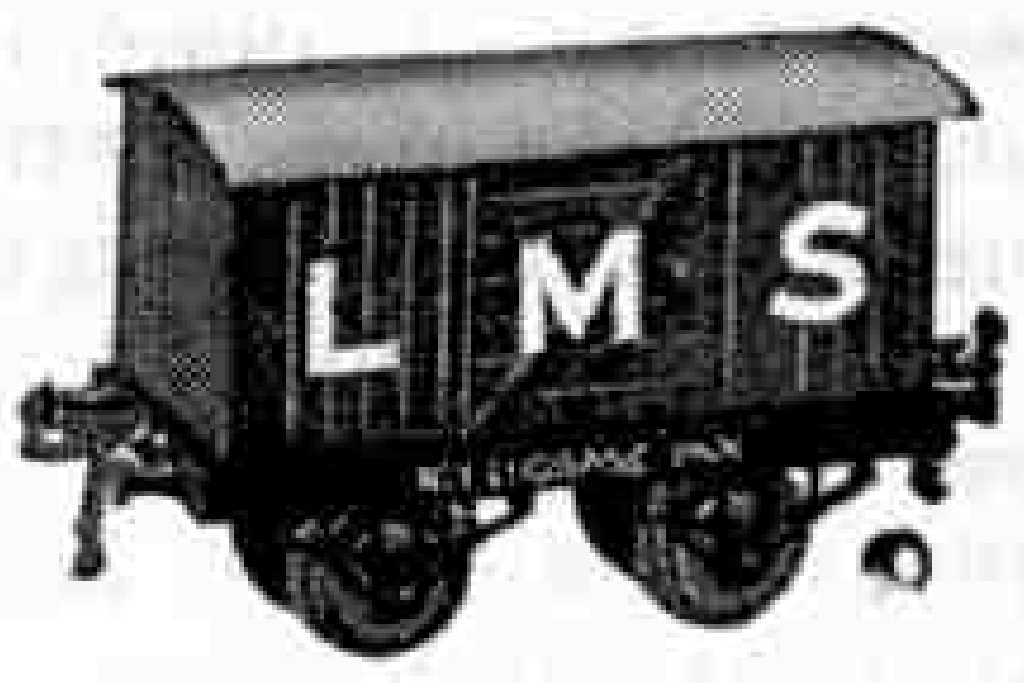
***SNOW PLOUGH**
With revolving plough driven from front axle.
Price 5/6



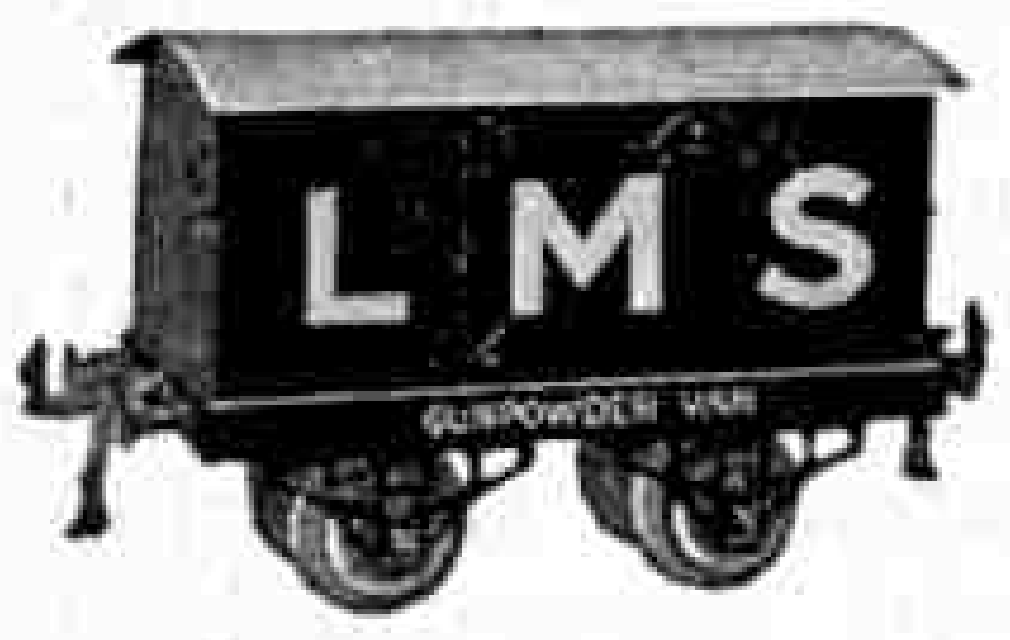
HORNBY No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price 15/-



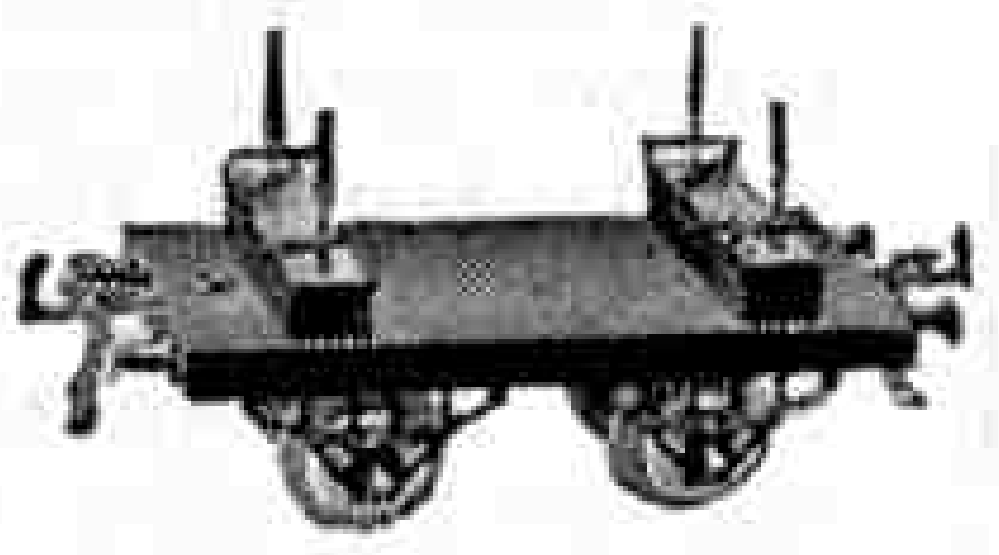
***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors.
Price 3/9



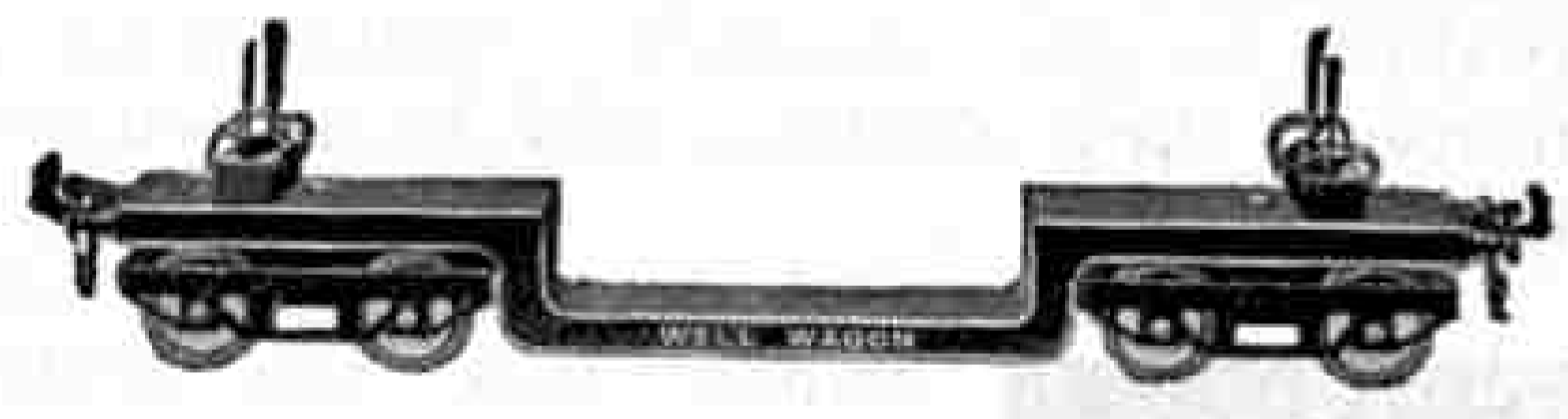
***LUGGAGE VAN No. 1**
With opening doors.
Price 3/6



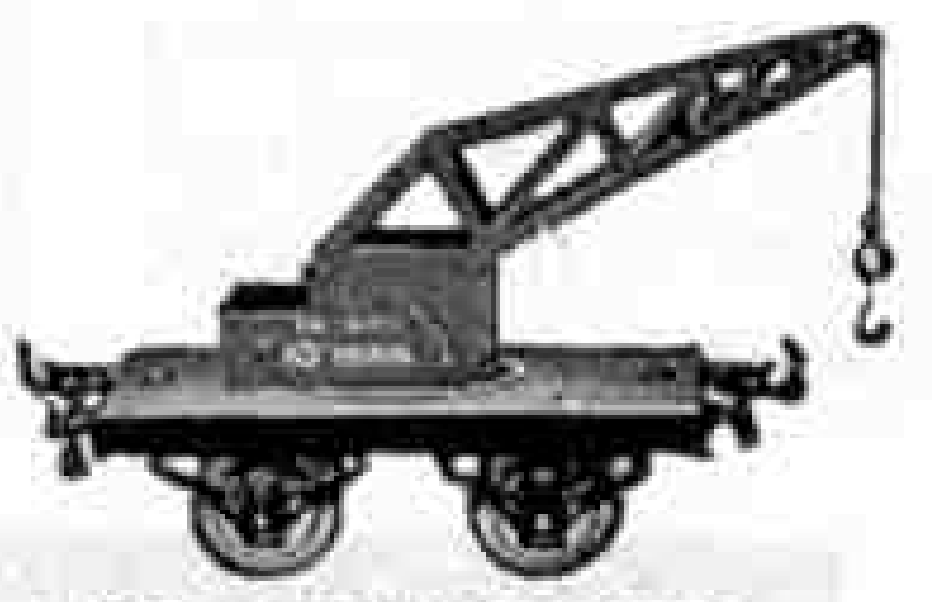
***GUNPOWDER VAN**
Finished in red, with opening doors. Price 3/6



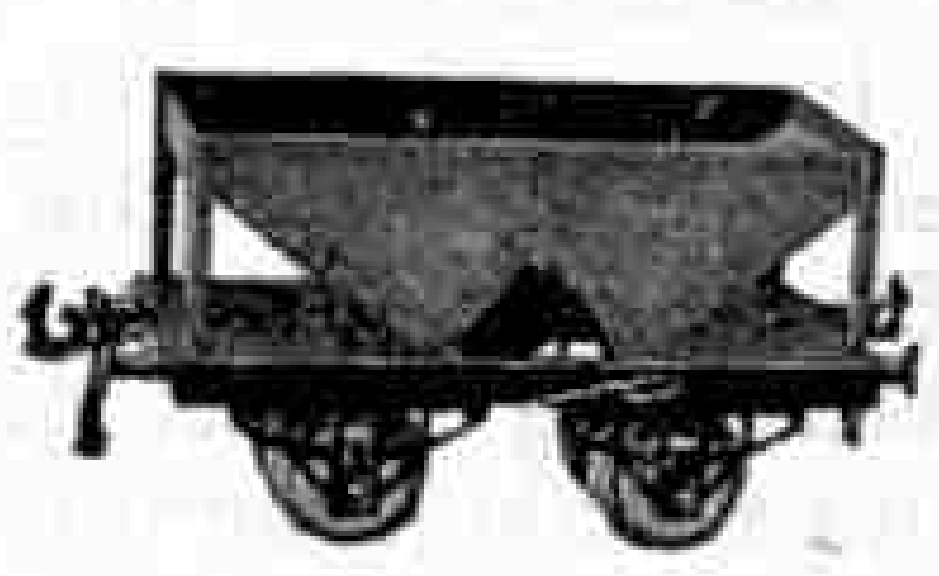
***LUMBER WAGON No. 1**
Fitted with bolsters and stanchions for log transport. Price 2/-



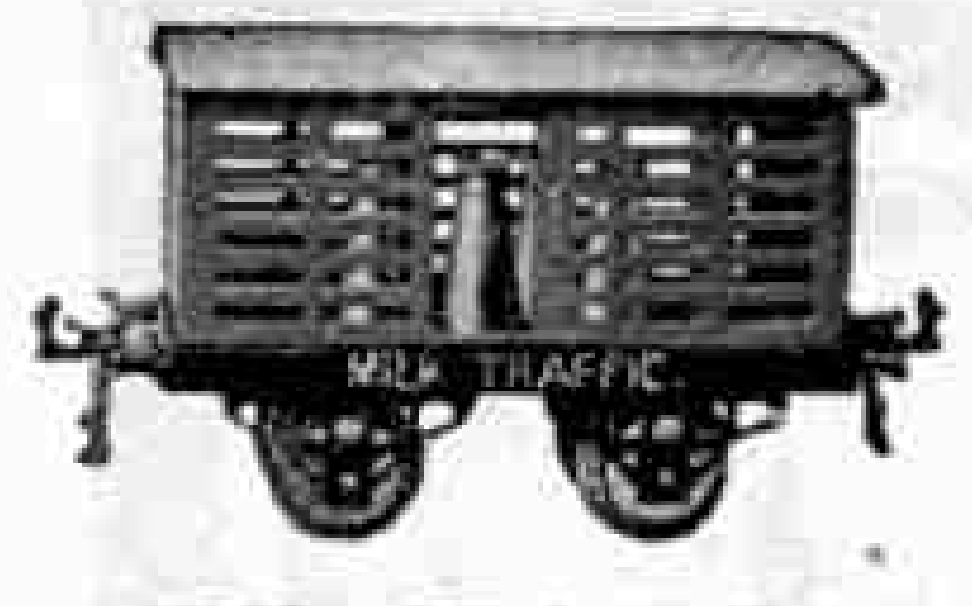
***TROLLEY WAGON**
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price 4/6



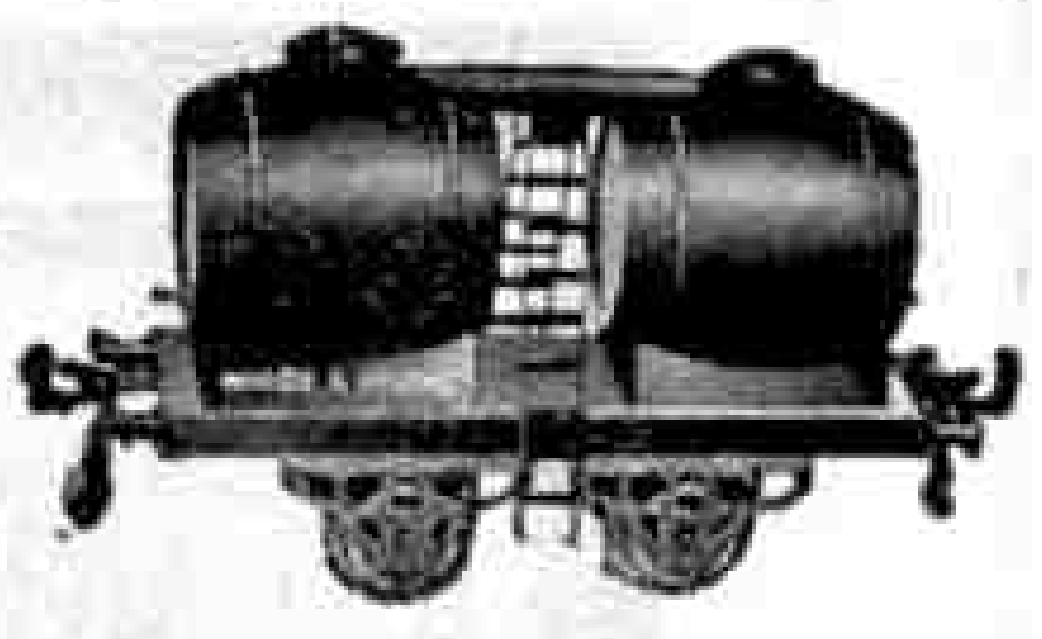
***CRANE TRUCK**
Finished in brown and blue. Price 3/6



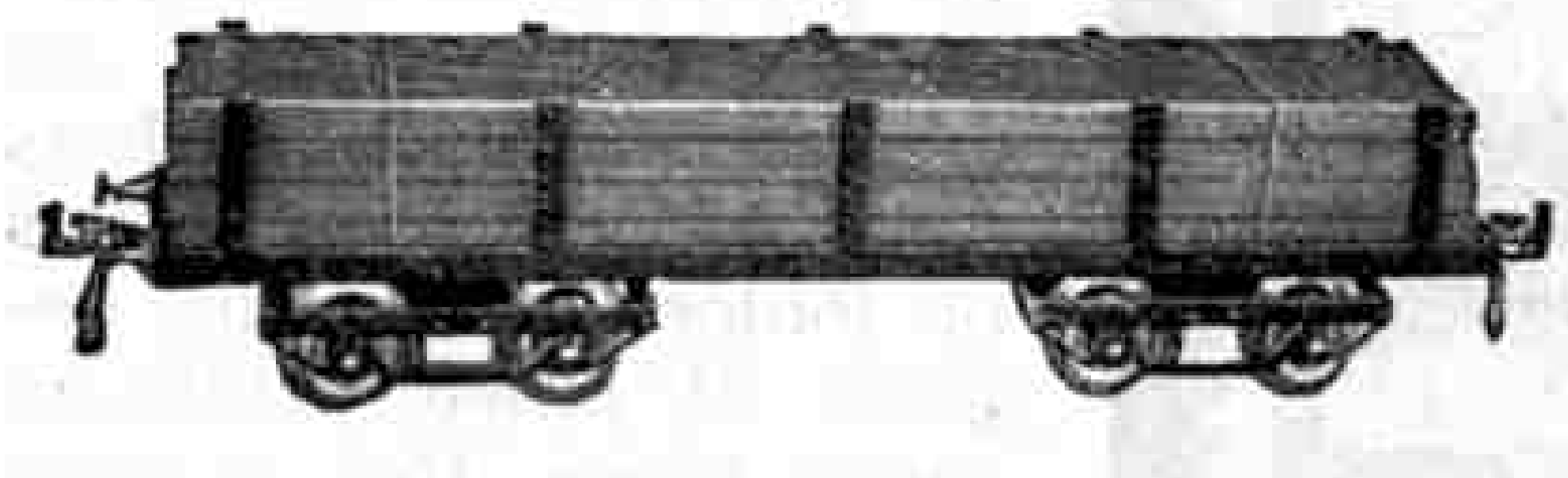
***HOPPER WAGON**
Mechanically unloaded.
Finished in green. Price 3/6



***MILK TRAFFIC VAN**
Fitted with sliding door, complete with milk cans.
Price 3/6

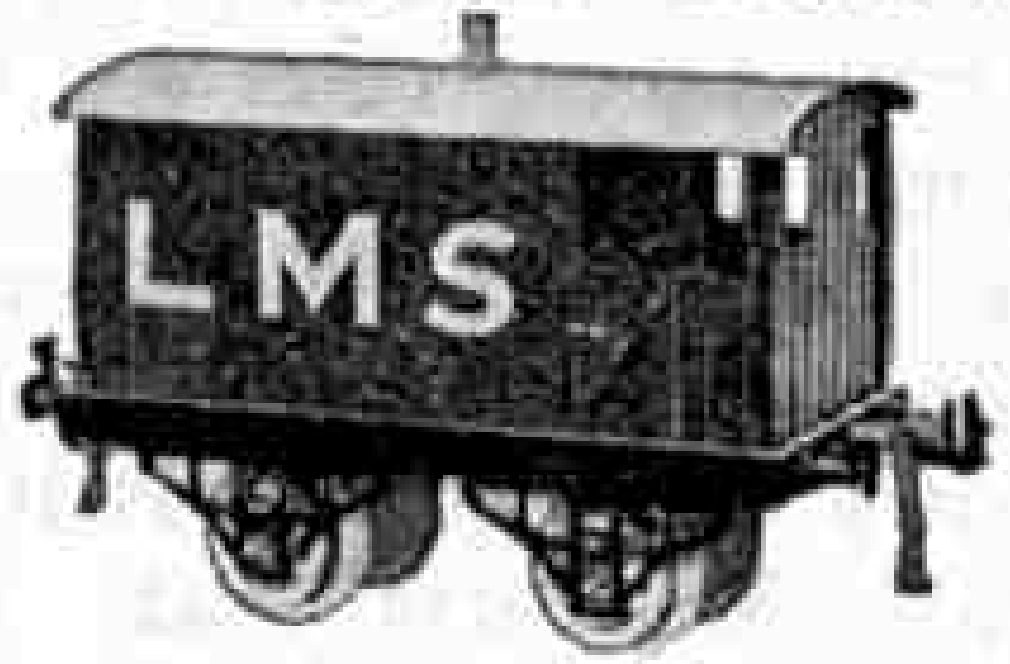


WINE WAGON, DOUBLE BARREL
An attractive model, artistically enamelled in red and green. Price 5/-



***TIMBER WAGON No. 2**
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price 3/6

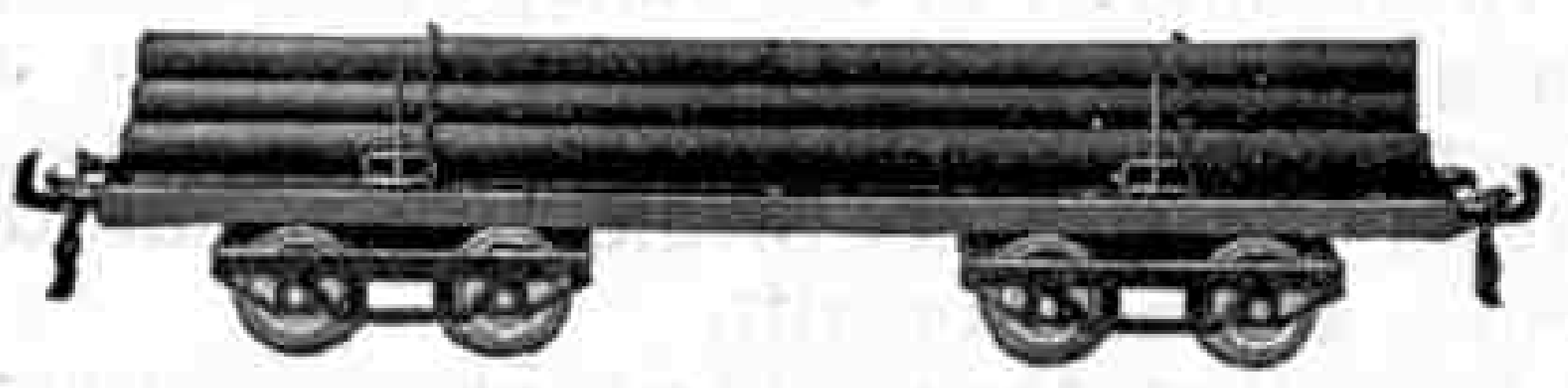
BRAKE VAN
Finished in brown, with opening doors. Obtainable in N.E. or S.R. lettering. Price 3/6



BRAKE VAN
Finished in Grey, with opening doors. Obtainable with L.M.S. or G.W. lettering. Price 3/6

JACOB'S BISCUIT VAN
Finished in crimson lake, with opening doors.
Price 3/6

CARR'S BISCUIT VAN
Finished in blue, with opening doors. Price 3/6



***LUMBER WAGON No. 2**
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
Price 4/-

CRAWFORD'S BISCUIT VAN
Finished in red, with opening doors. Price 3/6

SECCOTINE VAN
Beautifully finished in blue with opening doors.
Price 3/6

**Lettered L.M.S., L.N.E.R., G.W., or S.R.*

Manufactured by MECCANO LIMITED, BINNS ROAD, OLD SWAN, LIVERPOOL

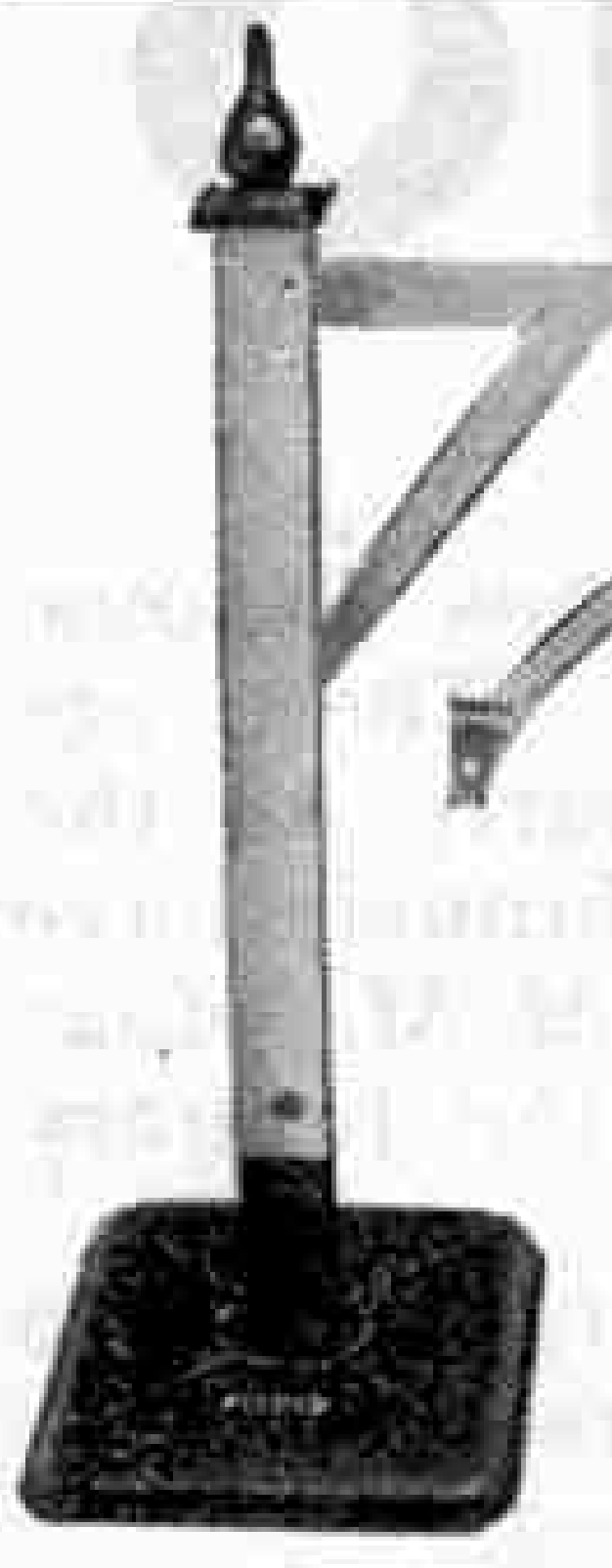
HORNBY SERIES

HORNBY ACCESSORIES

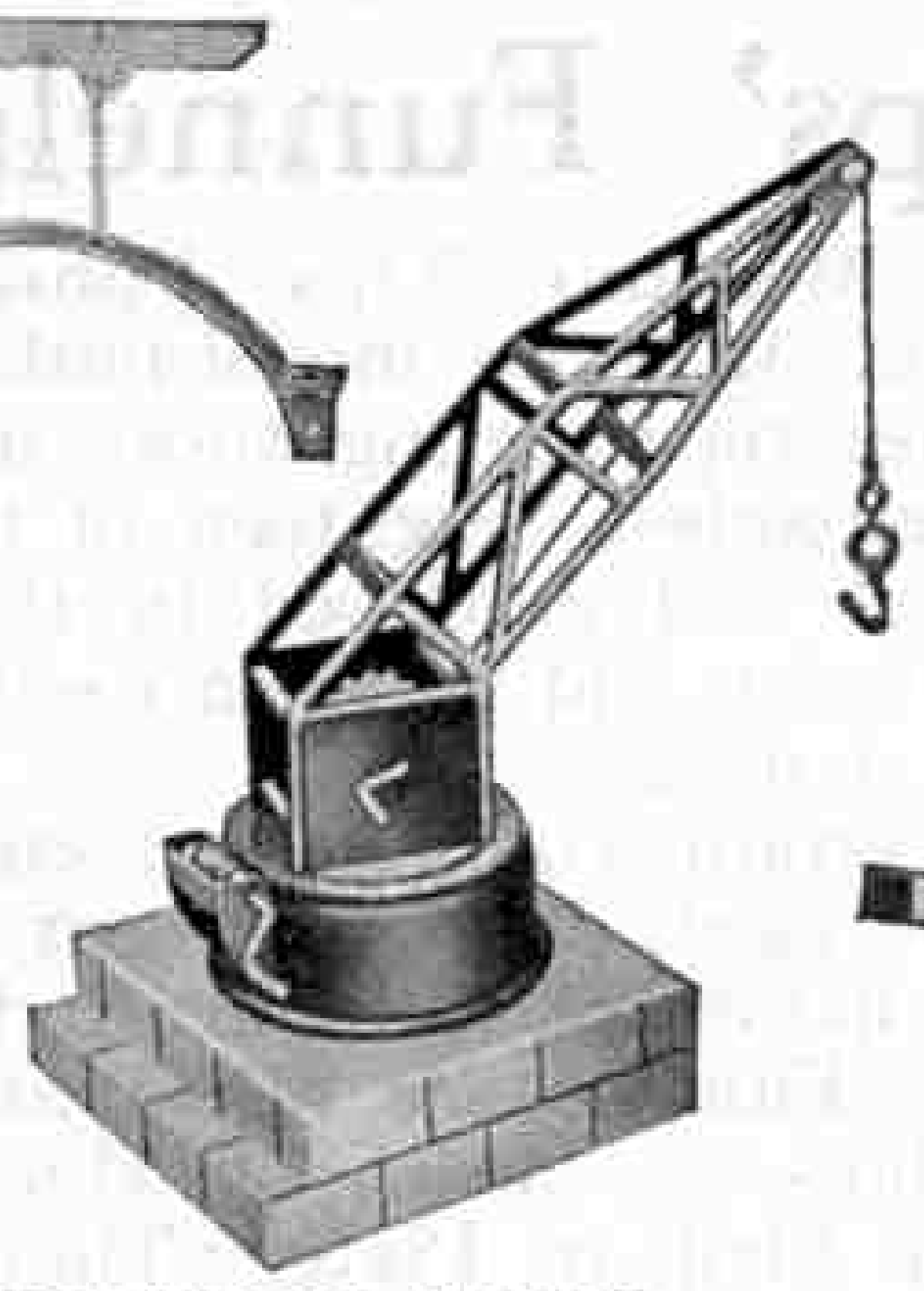
HORNBY SERIES

There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic Accessories the most elaborate model railway system may be constructed and operated in exactly the same manner as a real railway.

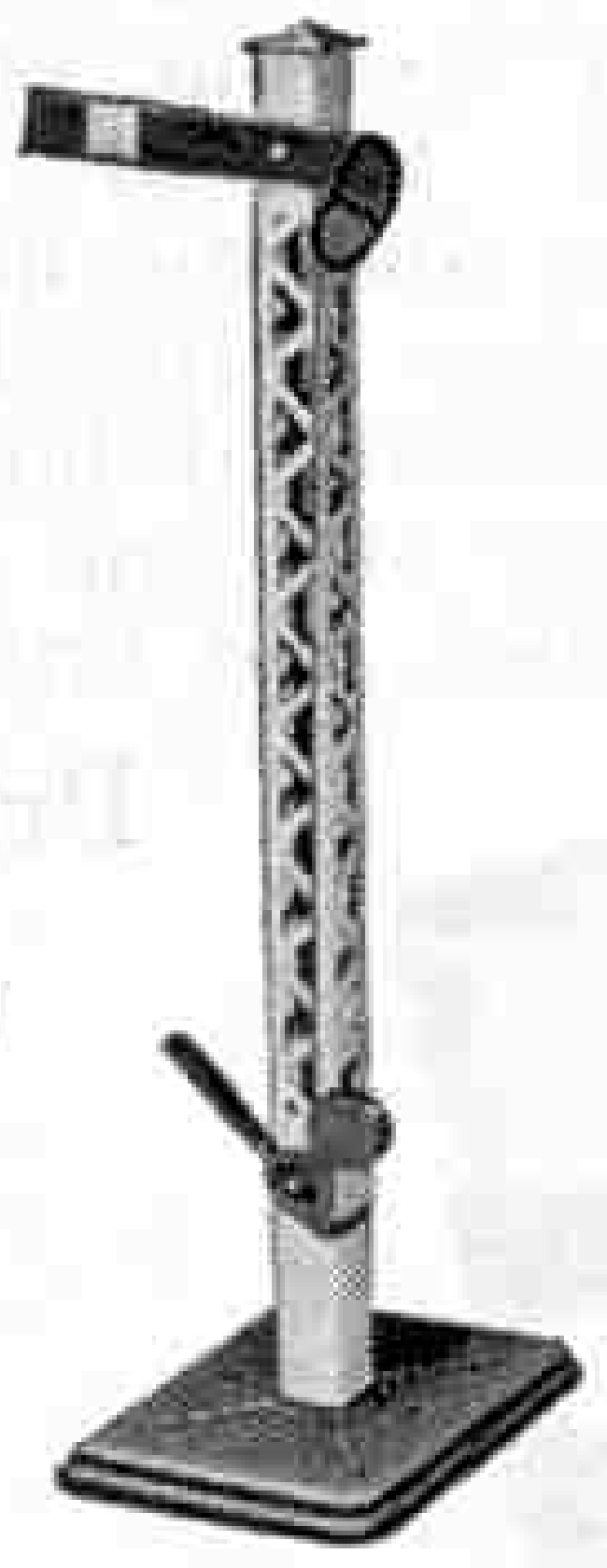
A selection of Hornby Accessories is illustrated below. Your dealer will be pleased to show you the full range.



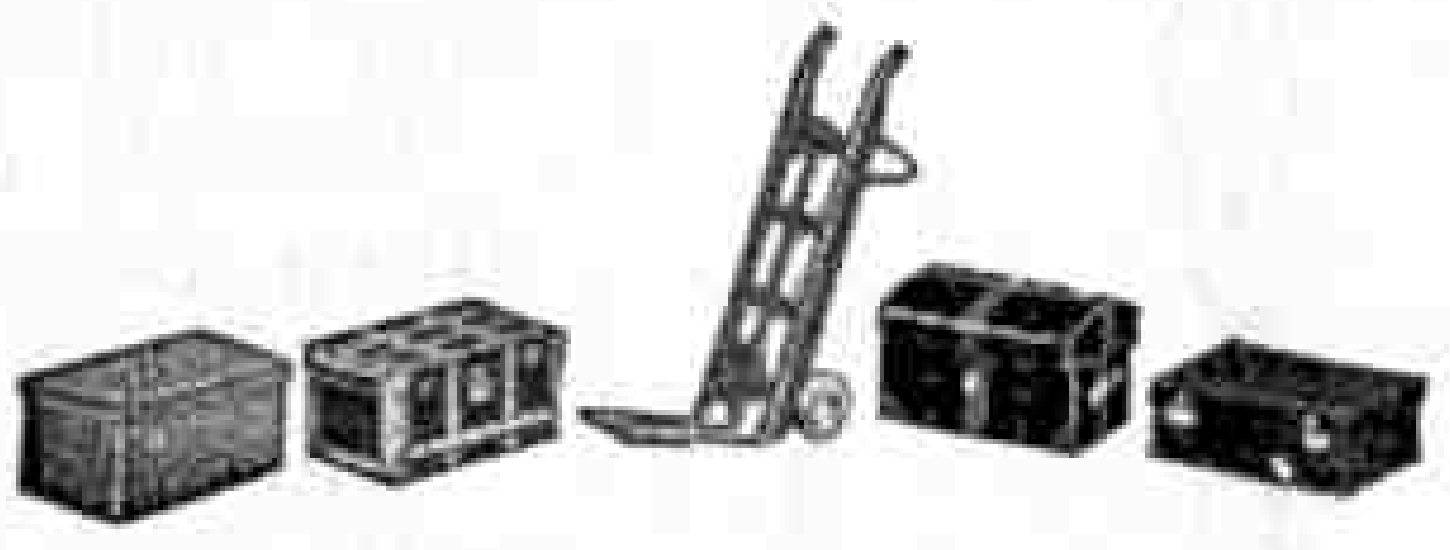
LOADING GAUGE
Price 2/3



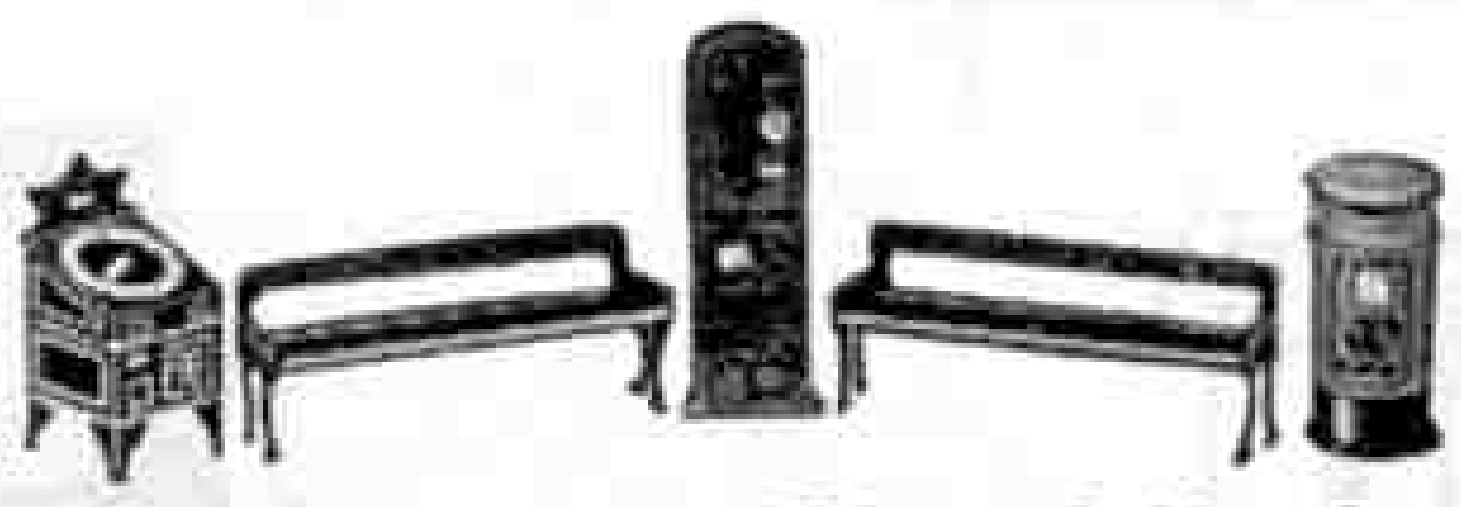
PLATFORM CRANE
This is a useful accessory. The Crane revolves on its base and is fitted with a crank and ratchet mechanism for controlling the load. Price 4/9



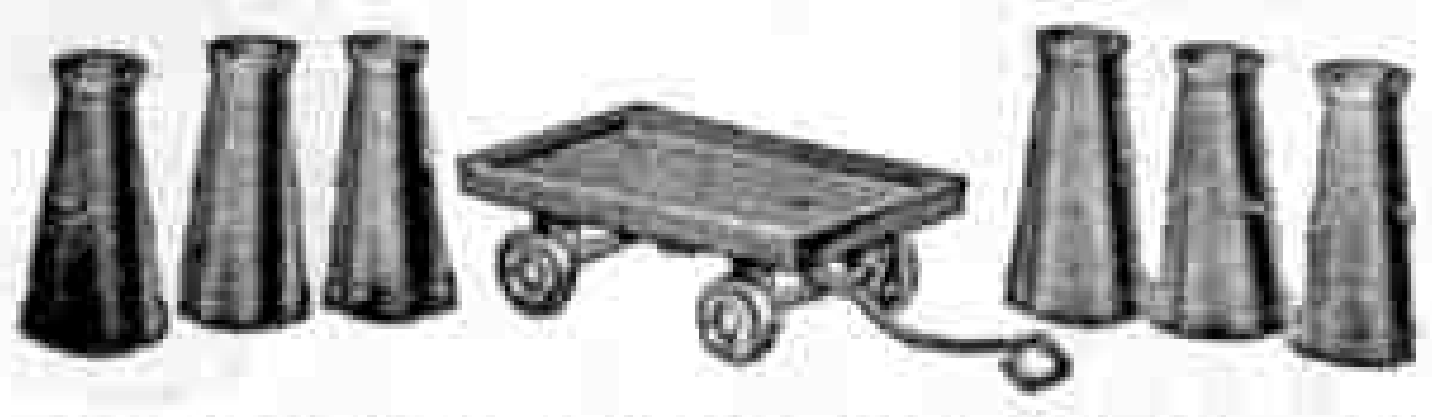
SIGNAL No. 1
Price 3/3 per pair. One "Home" and one "Distant."



RAILWAY ACCESSORIES No. 1
Miniature Luggage and Truck.
Price per set 1/6

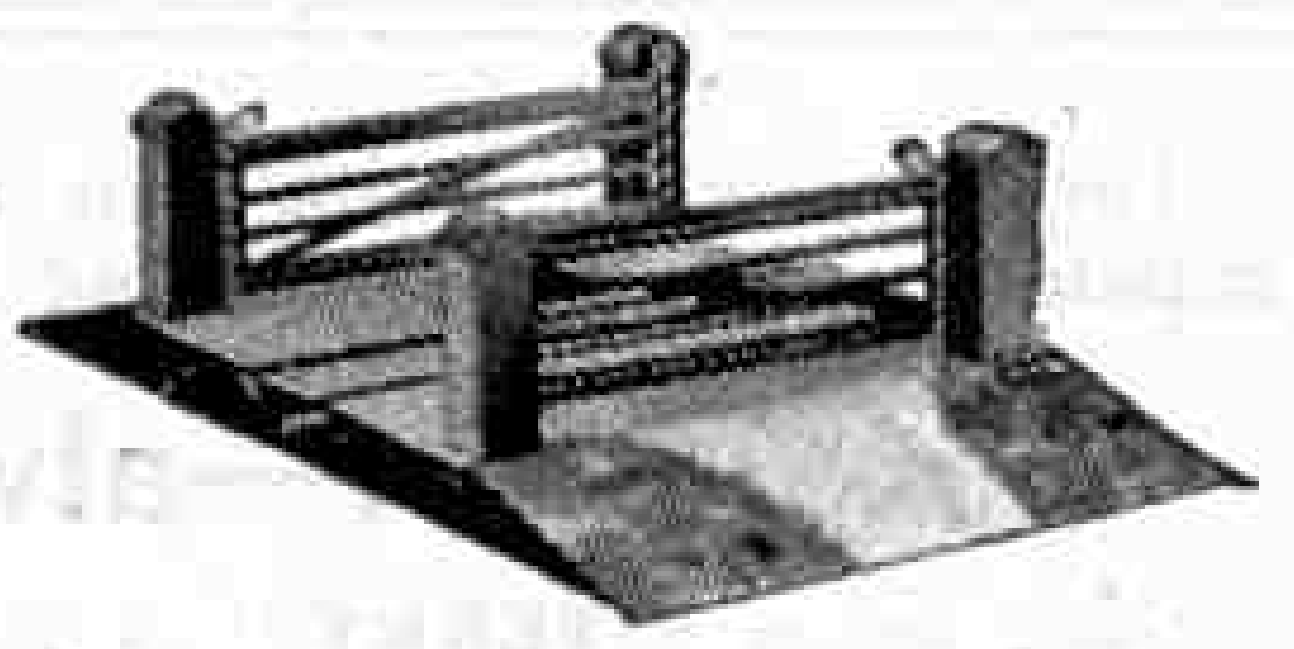


RAILWAY ACCESSORIES No. 3
Platform Machines, etc.
Price, per set 1/6

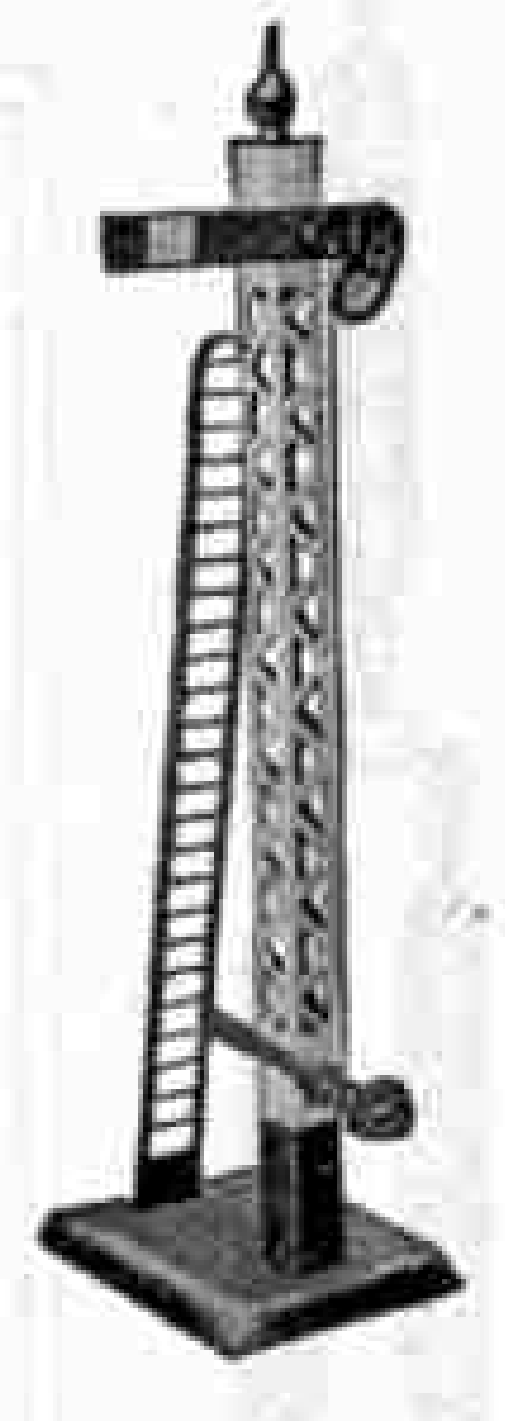


RAILWAY ACCESSORIES No. 2
Milk Cans and Truck.
Price, per set 1/6

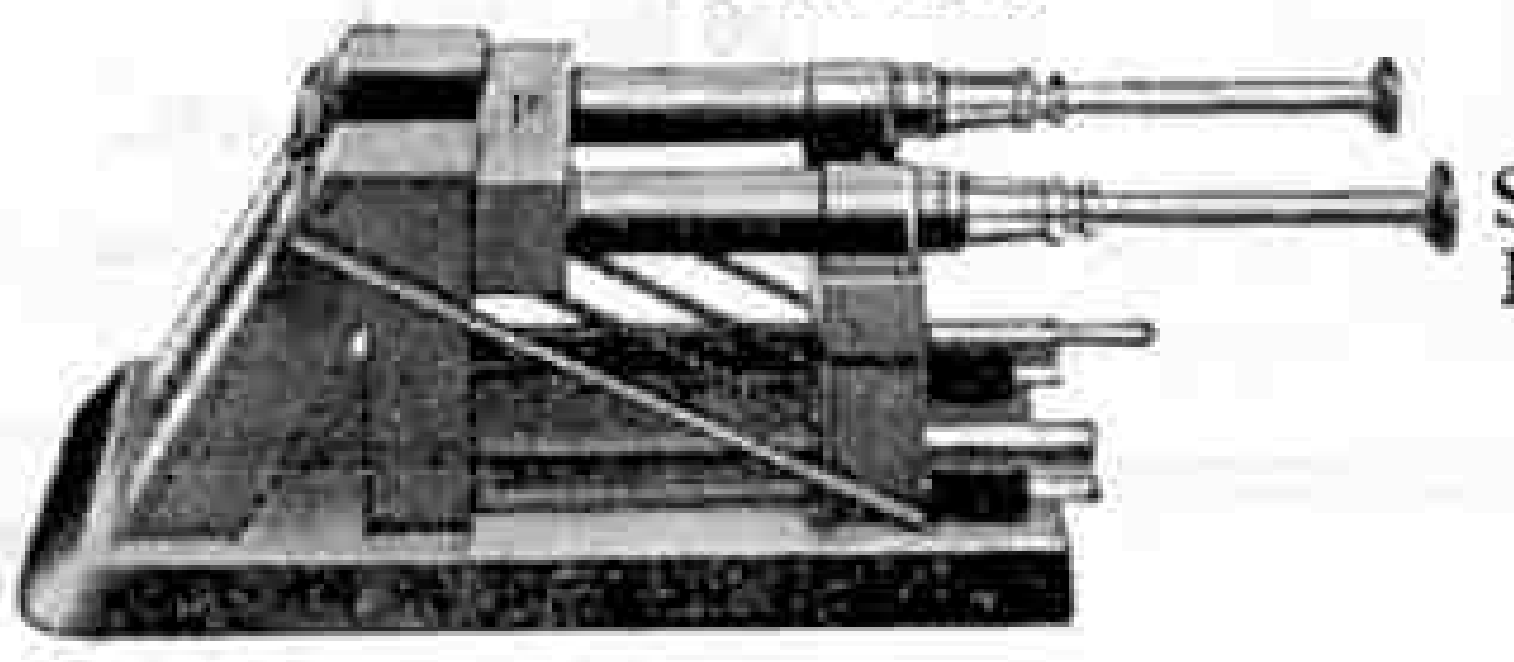
RAILWAY ACCESSORIES No. 4. This set comprises all the pieces that are contained in Railway Accessories Nos. 1, 2 and 3 ... ... Price 3/9



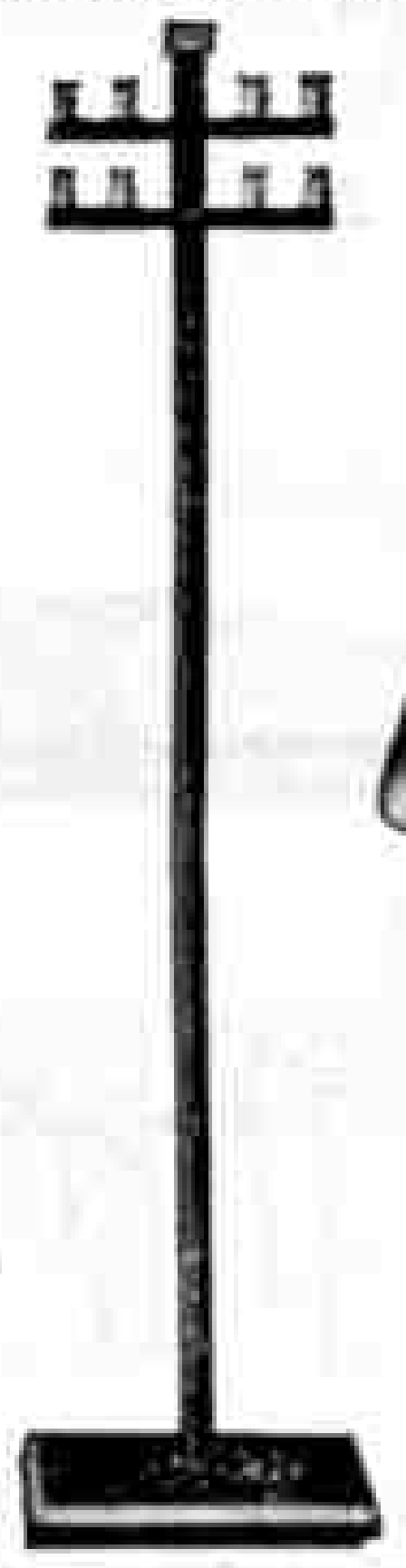
LEVEL CROSSING No. 1
This model is realistic in appearance and beautifully enamelled in colours. It is suitable for a single track only and has gauge 0 rails in position.
Price 3/6



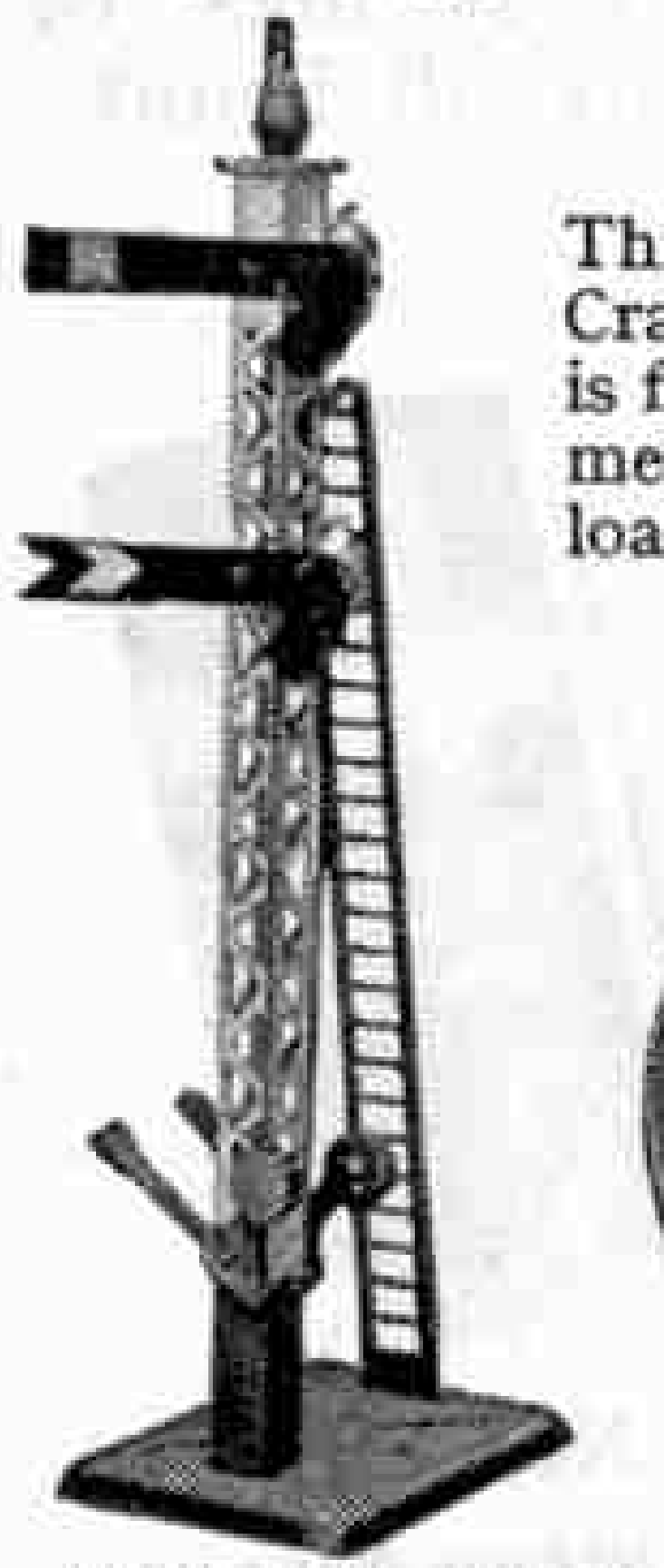
SIGNAL No. 2
Price 2/6 each.
"Home" or "Distant."



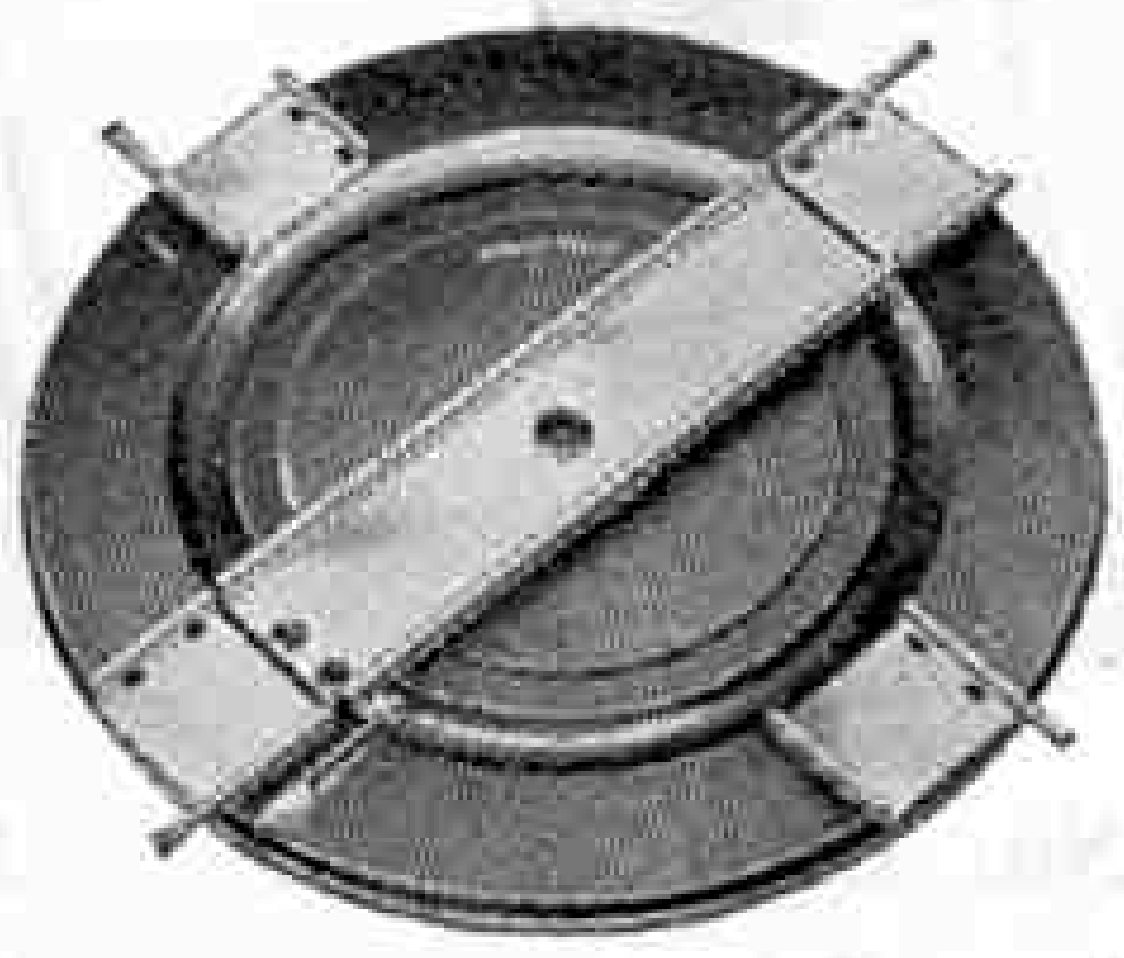
BUFFER STOPS No. 2 (HYDRAULIC)
Price 5/6



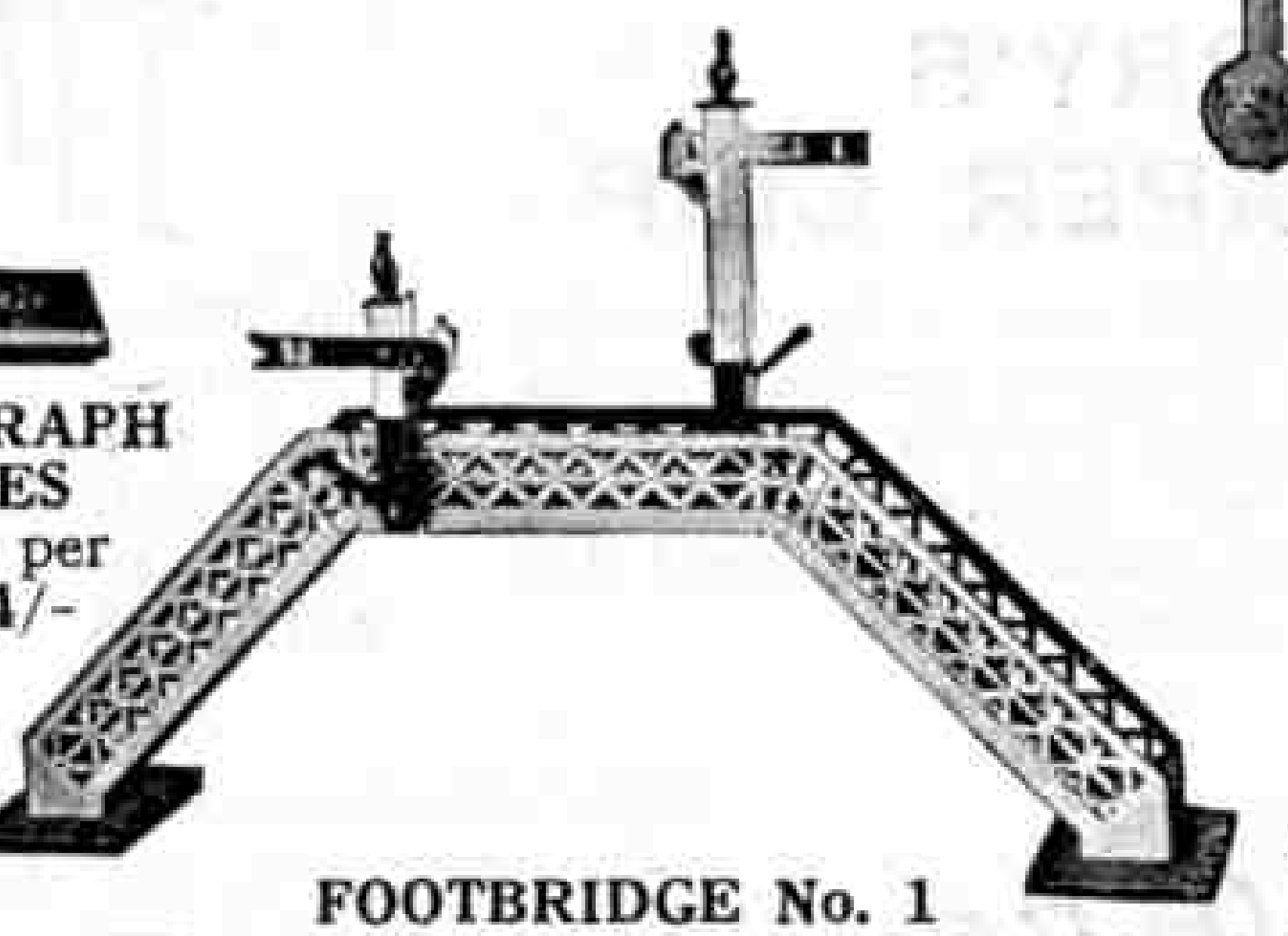
TELEGRAPH POLES
Price, per pair 4/-



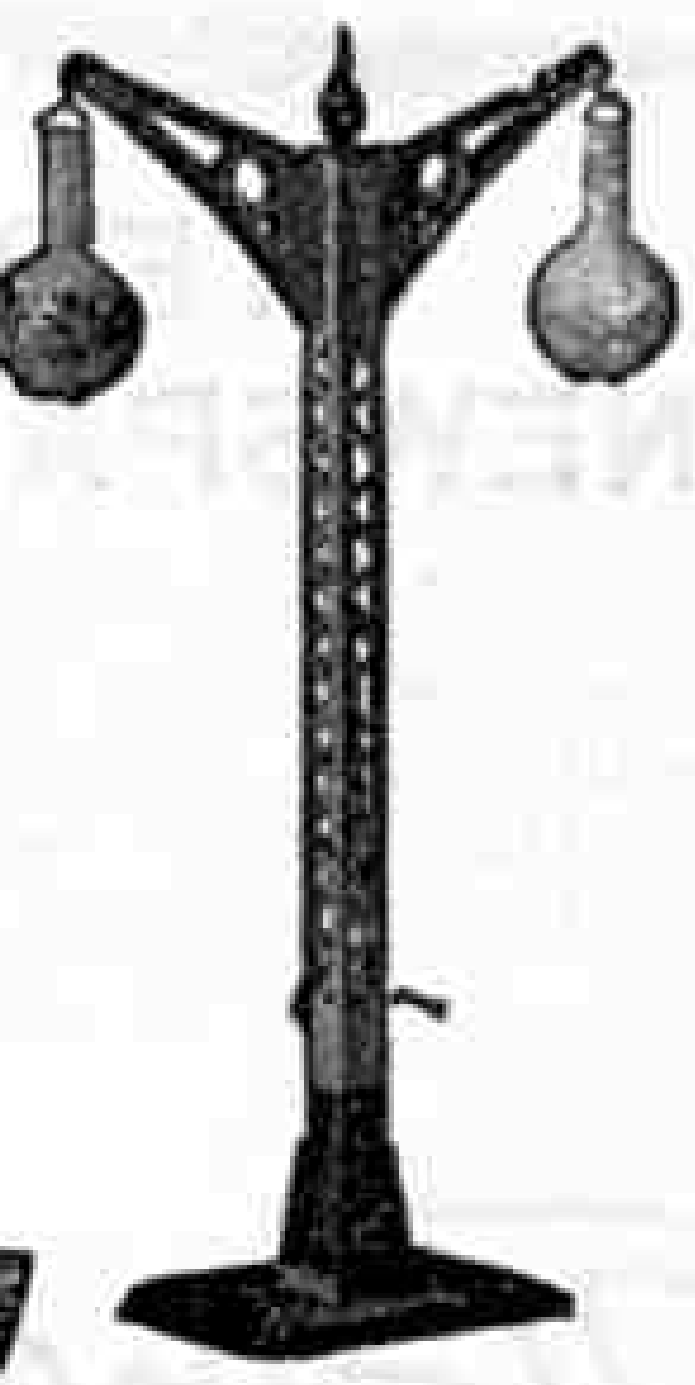
DOUBLE ARM SIGNAL No. 1
Price 4/3 per pair.
DOUBLE ARM SIGNAL No. 2
(As illustrated.)
Price 3/- each.



TURNTABLE No. 1
Price 2/9

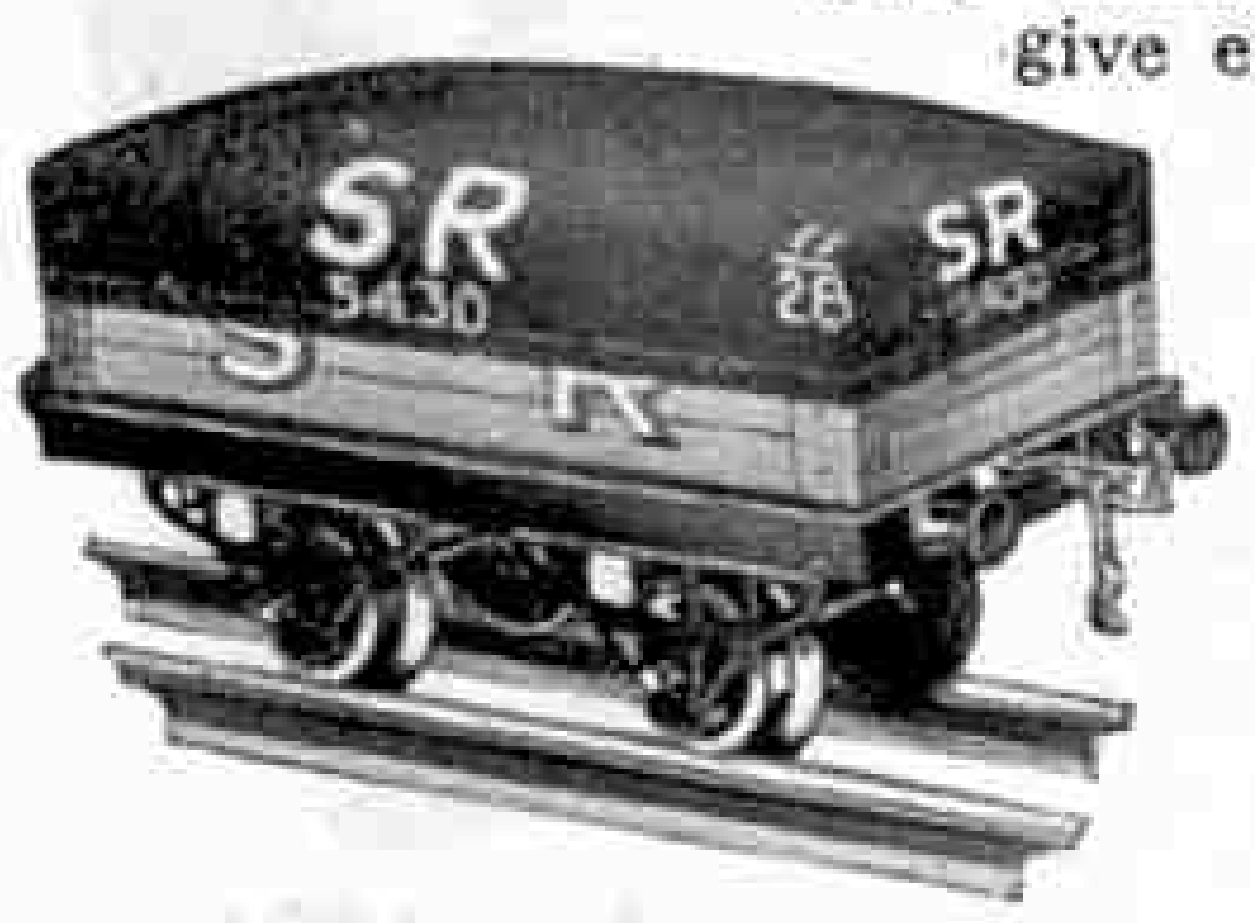


FOOTBRIDGE No. 1
(Without signals) ... Price 4/-
FOOTBRIDGE No. 2
(As illustrated), complete with detachable signals Price 7/6
Signals only, per pair 3/9



LAMP STANDARD No. 2 (DOUBLE)
Electric flash-lamp bulbs may be fitted into the globes.
Price 4/6

OIL CAN No. 1
This miniature Oil Can will give every satisfaction.
Price 6d.



TARPAULIN SHEETS
Strongly made. Lettered L.M.S., N.E., G.W. or S.R. The above illustration shows one of the Tarpaulin Sheets fitted to a Hornby Wagon.
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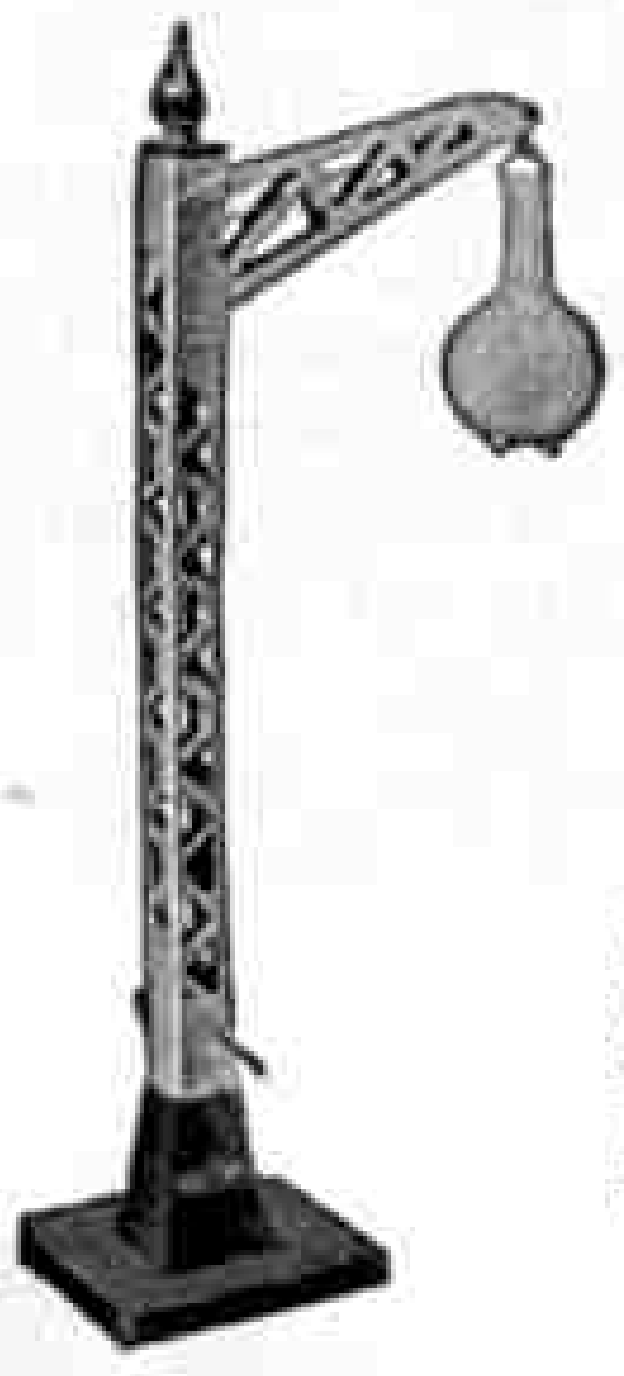
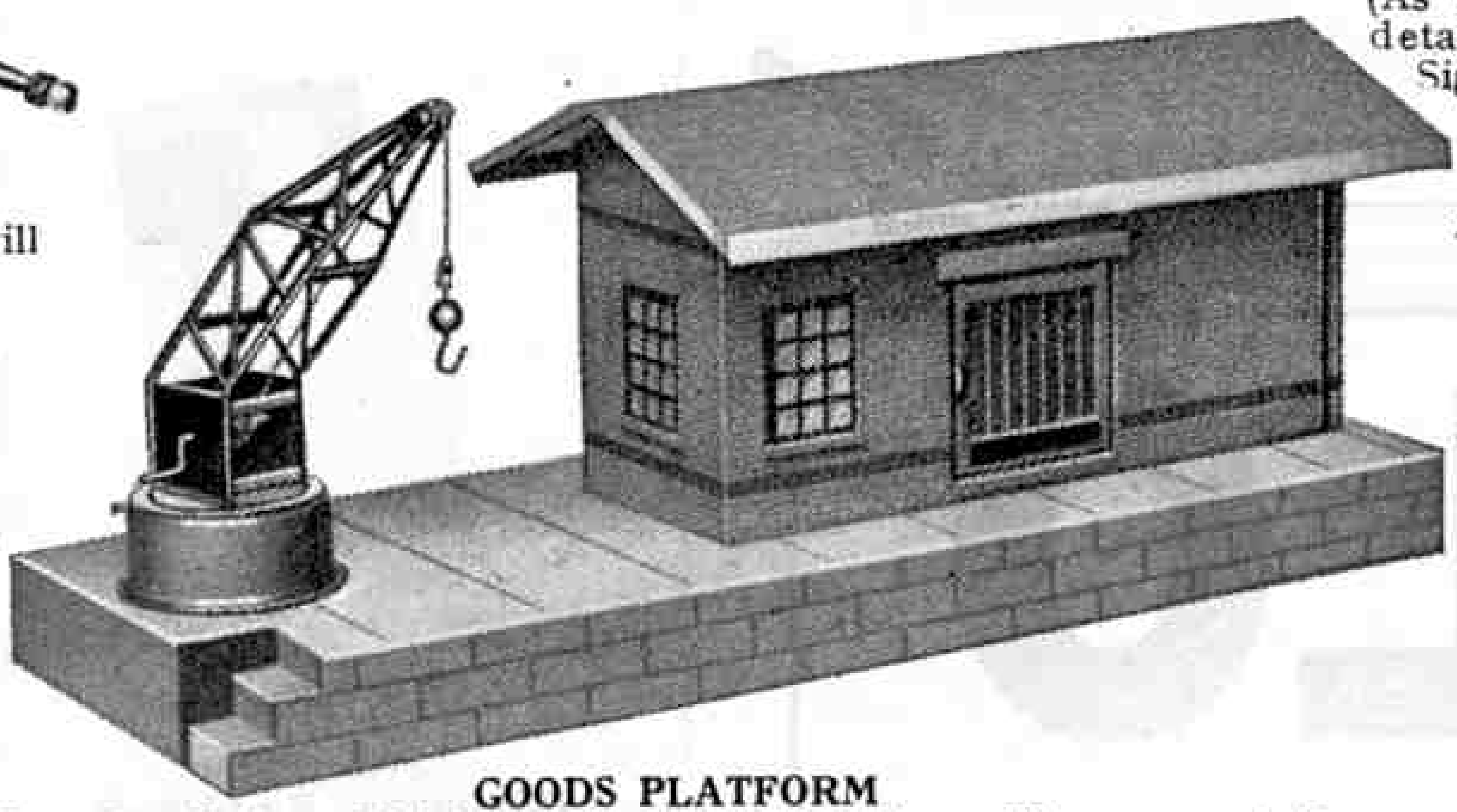
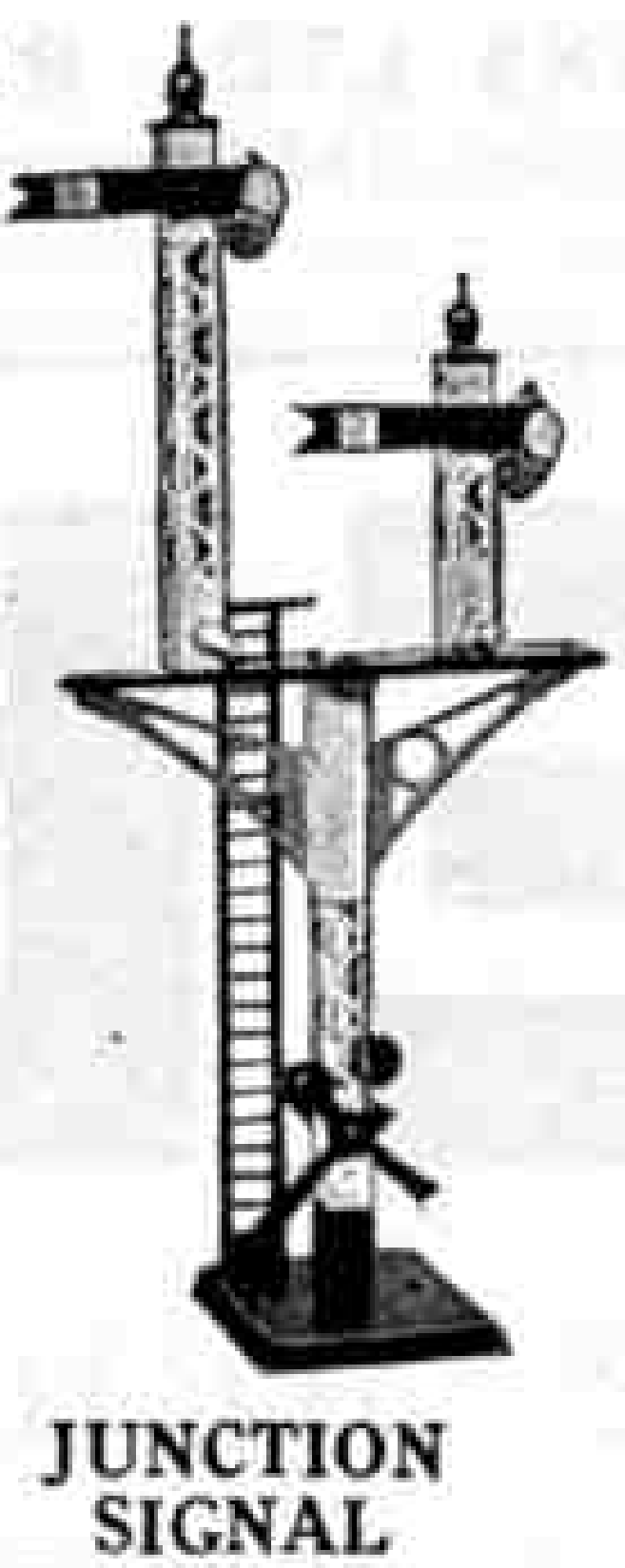


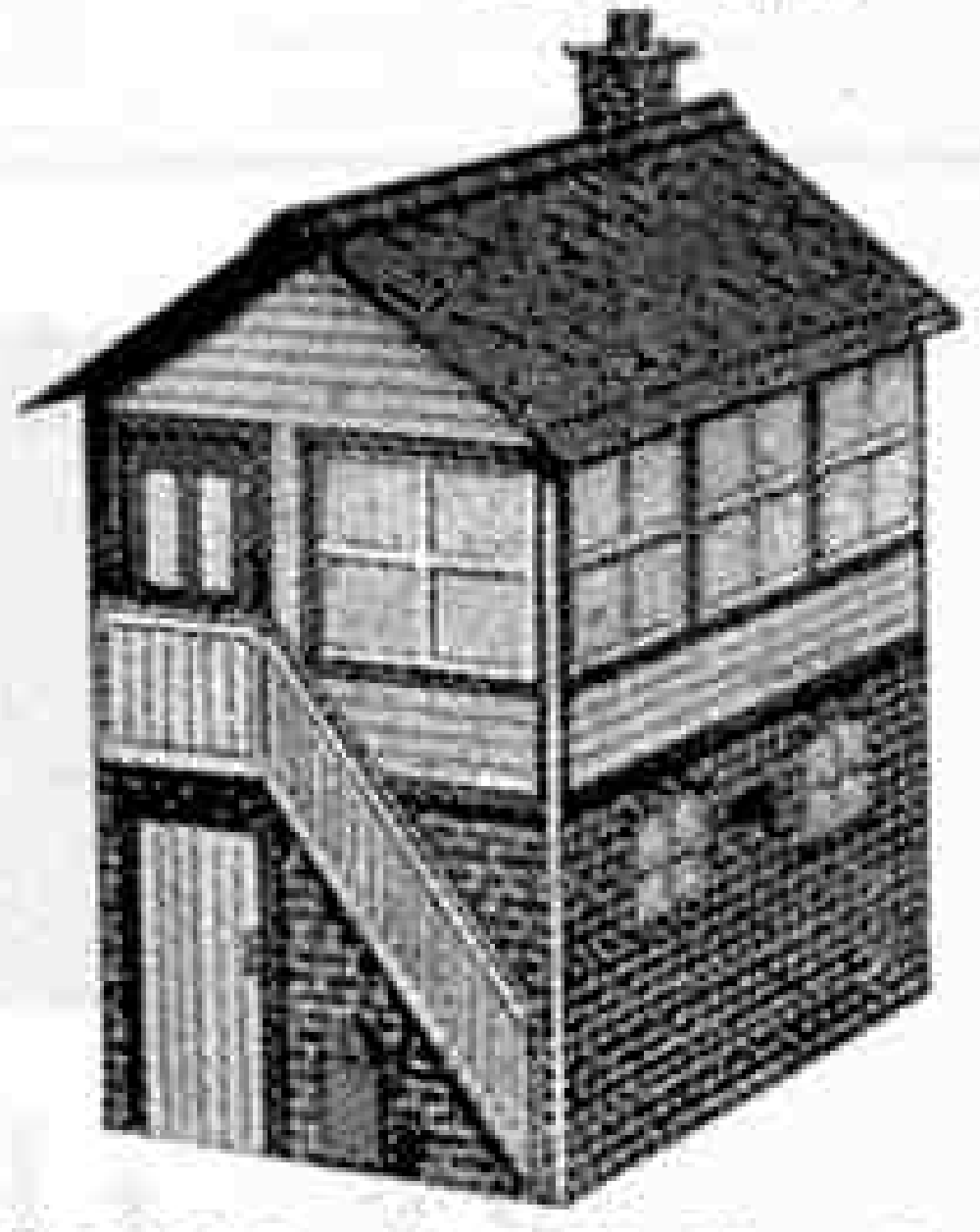
LAMP STANDARD No. 1 (SINGLE)
An electric flash-lamp bulb may be fitted into the globe. Price 3/6



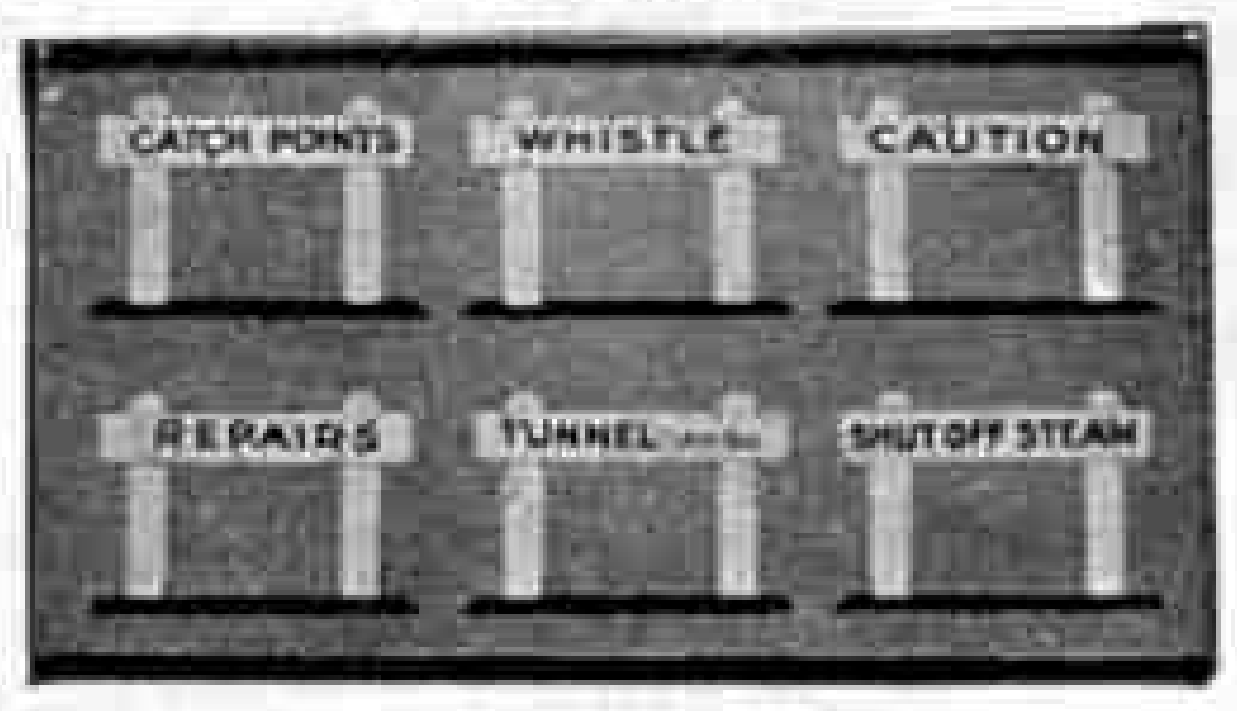
GOODS PLATFORM
Length 16½ ins. Height 6½ ins. Width 6 ins. The crane at the end of the platform revolves on its base. It is enamelled in colours and is fitted with a crank and ratchet mechanism for controlling the load ... ... Price 12/6



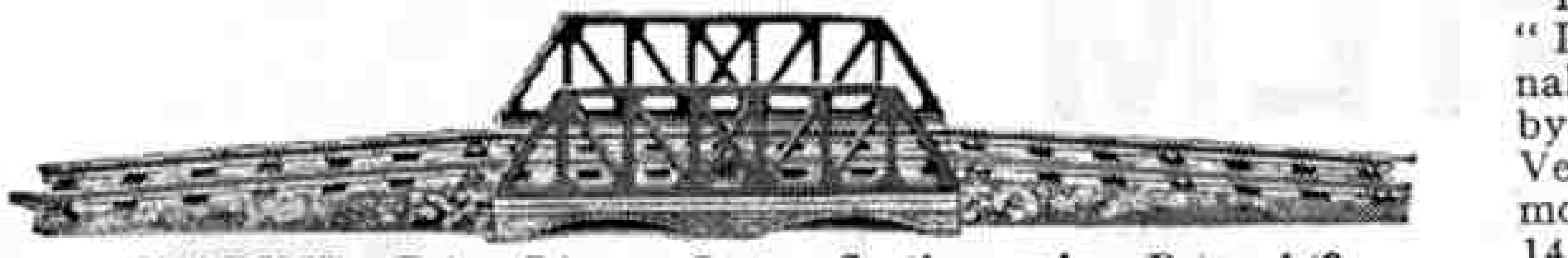
JUNCTION SIGNAL
"Home" or "Distant" Signal arms operated by levers at base. Very realistic model, standing 14 ins. in height.
Price 6/-



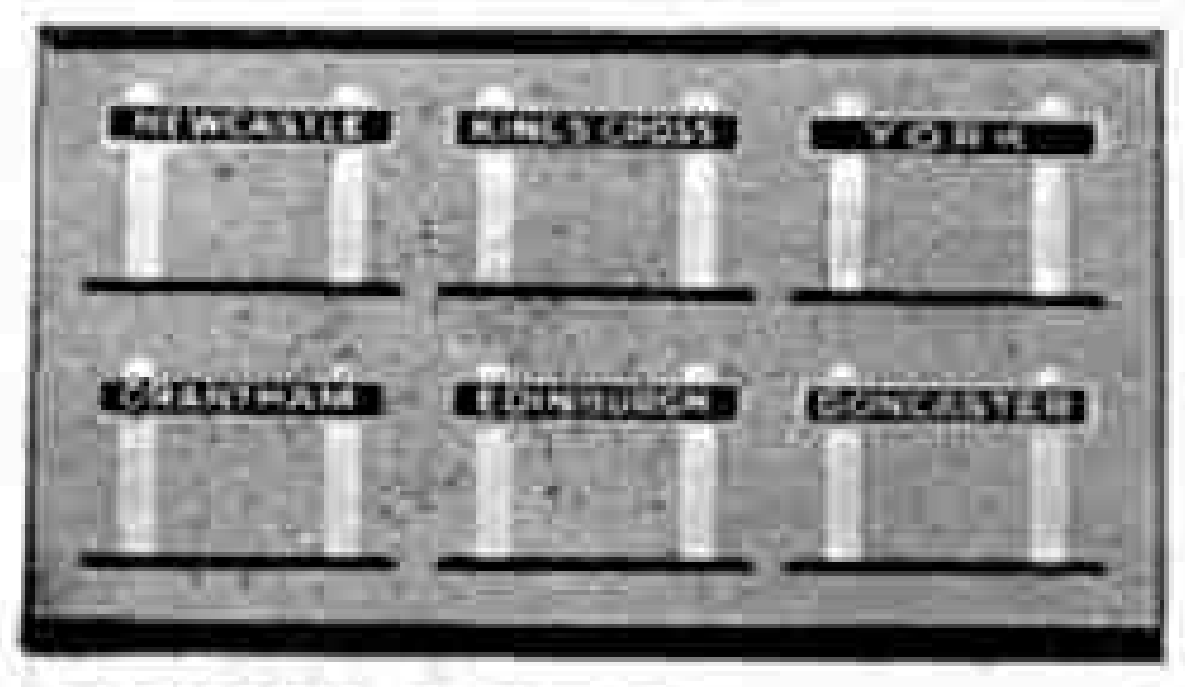
SIGNAL CABIN No. 1
Dimensions: Height 6 ins. Width 4½ ins. Length 6 ins. Finished in colours ... Price 2/9



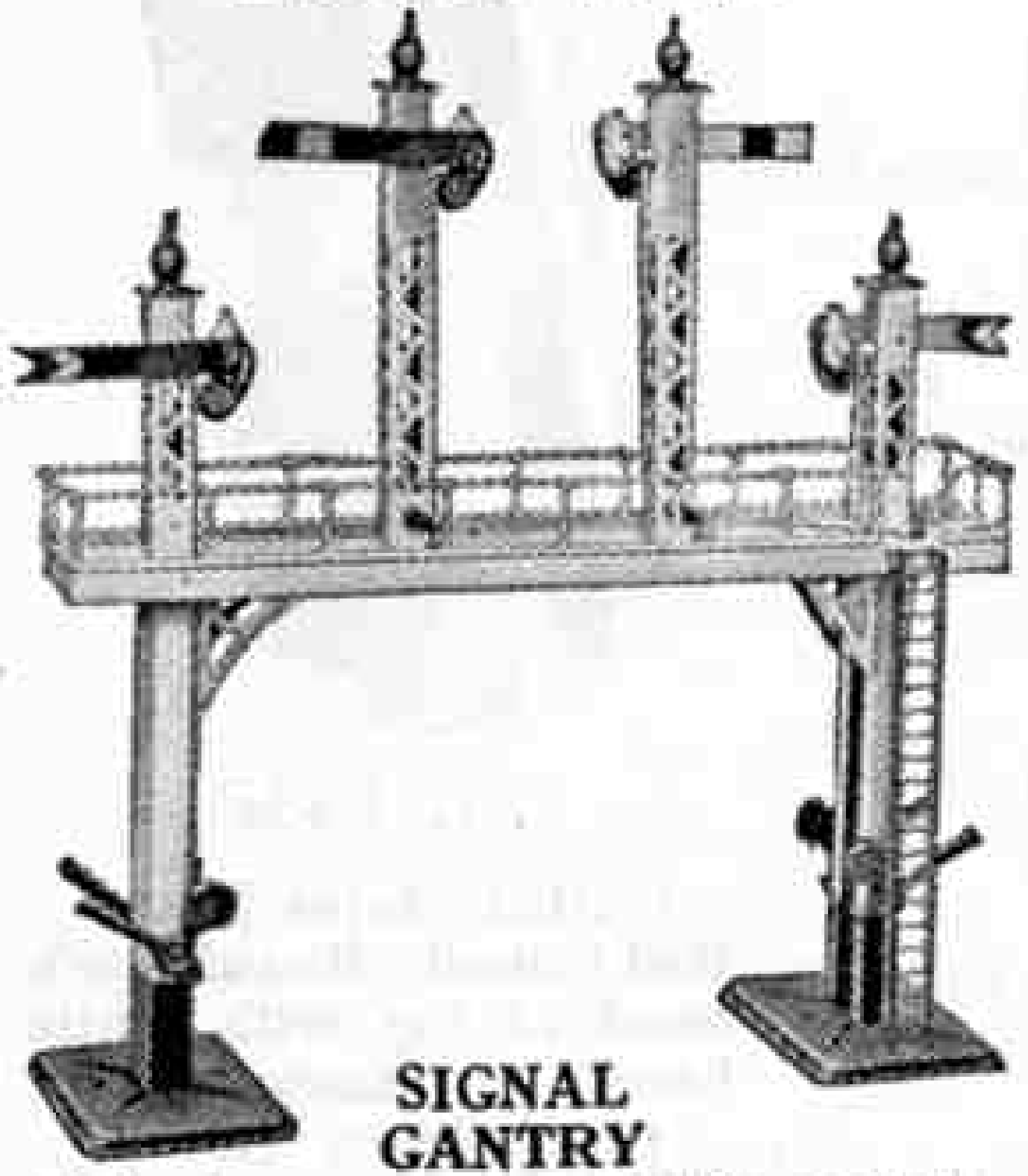
RAILWAY ACCESSORIES No. 8
Notice Boards.
Price, per set 2/3



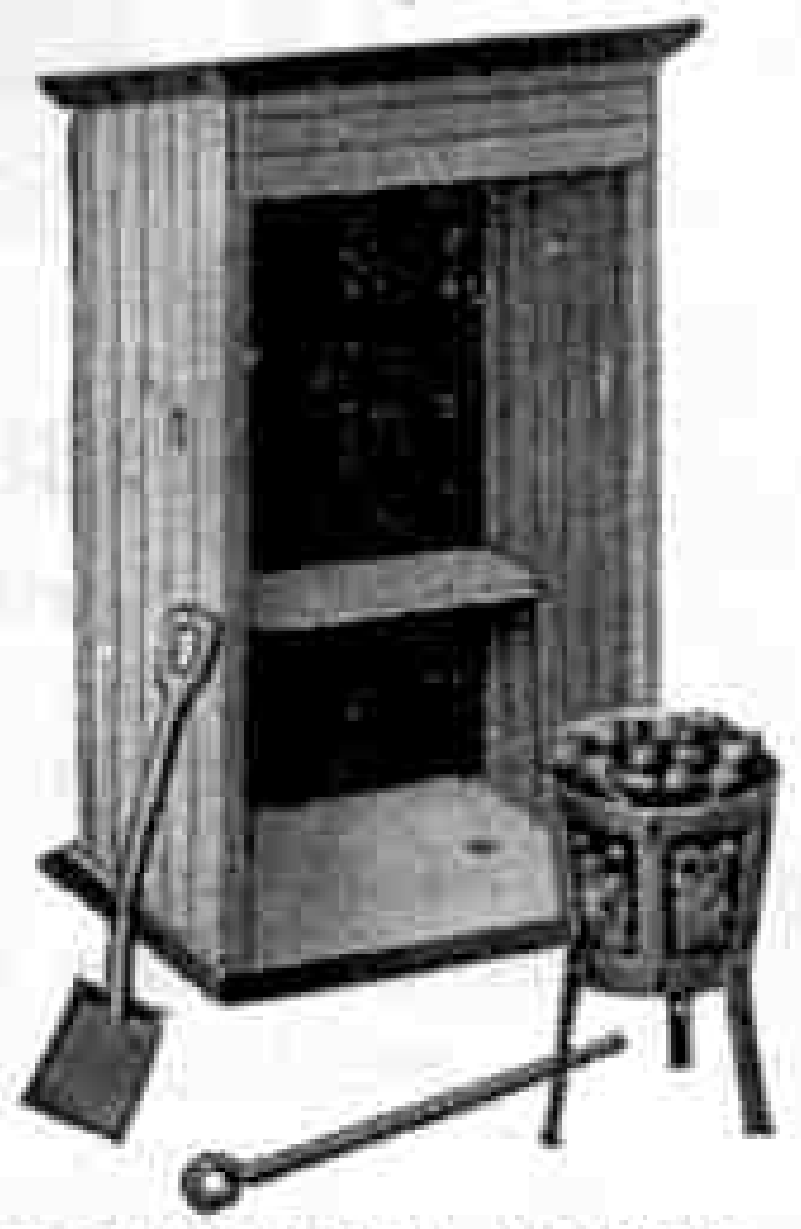
VIADUCT. Price 7/- Centre Section only. Price 4/9
ELECTRICAL VIADUCT. Price 8/-
Centre Section for Electrical Viaduct. Price 5/3



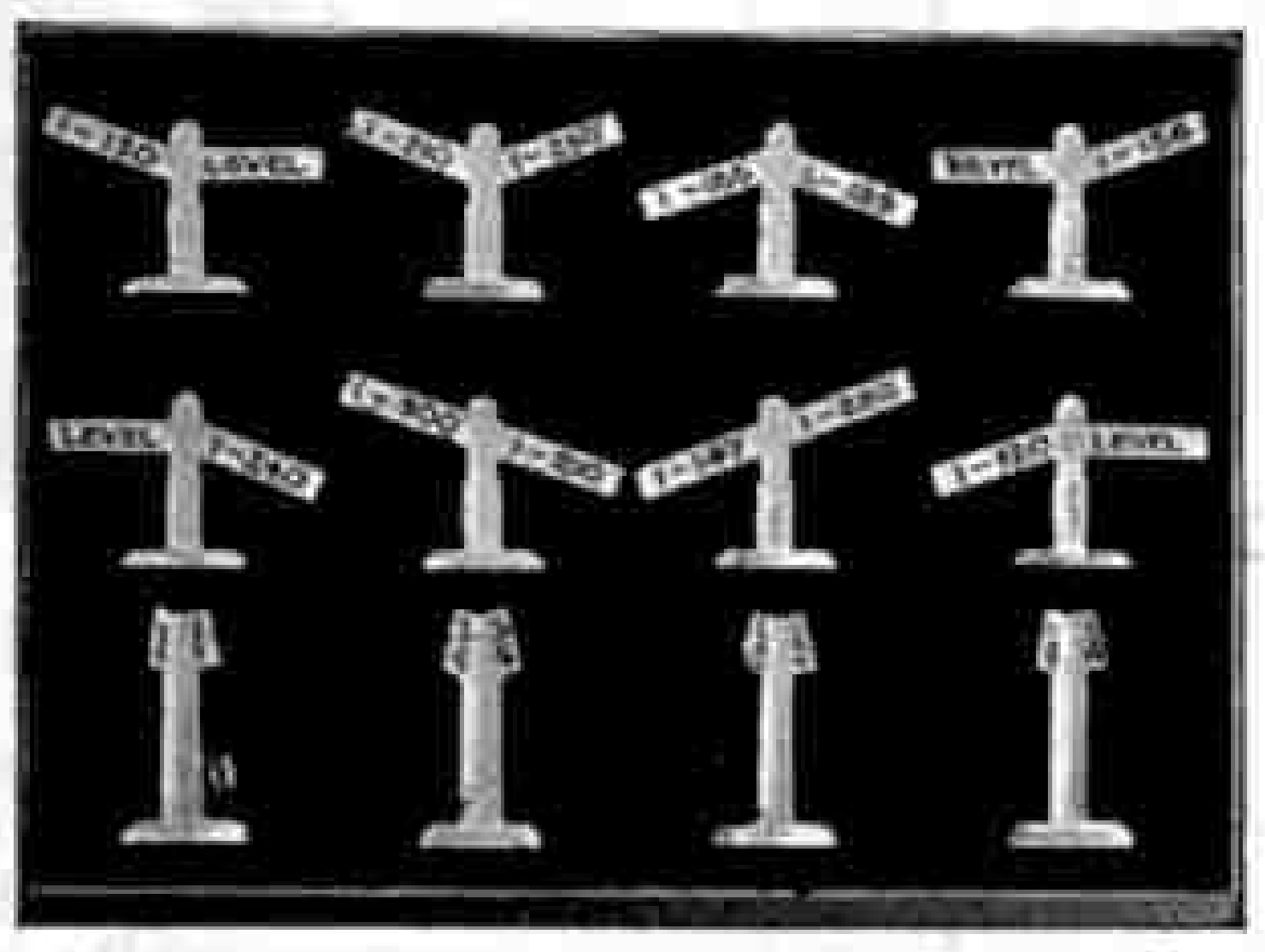
RAILWAY ACCESSORIES No. 9
Station Name Boards.
Price, per set 2/6



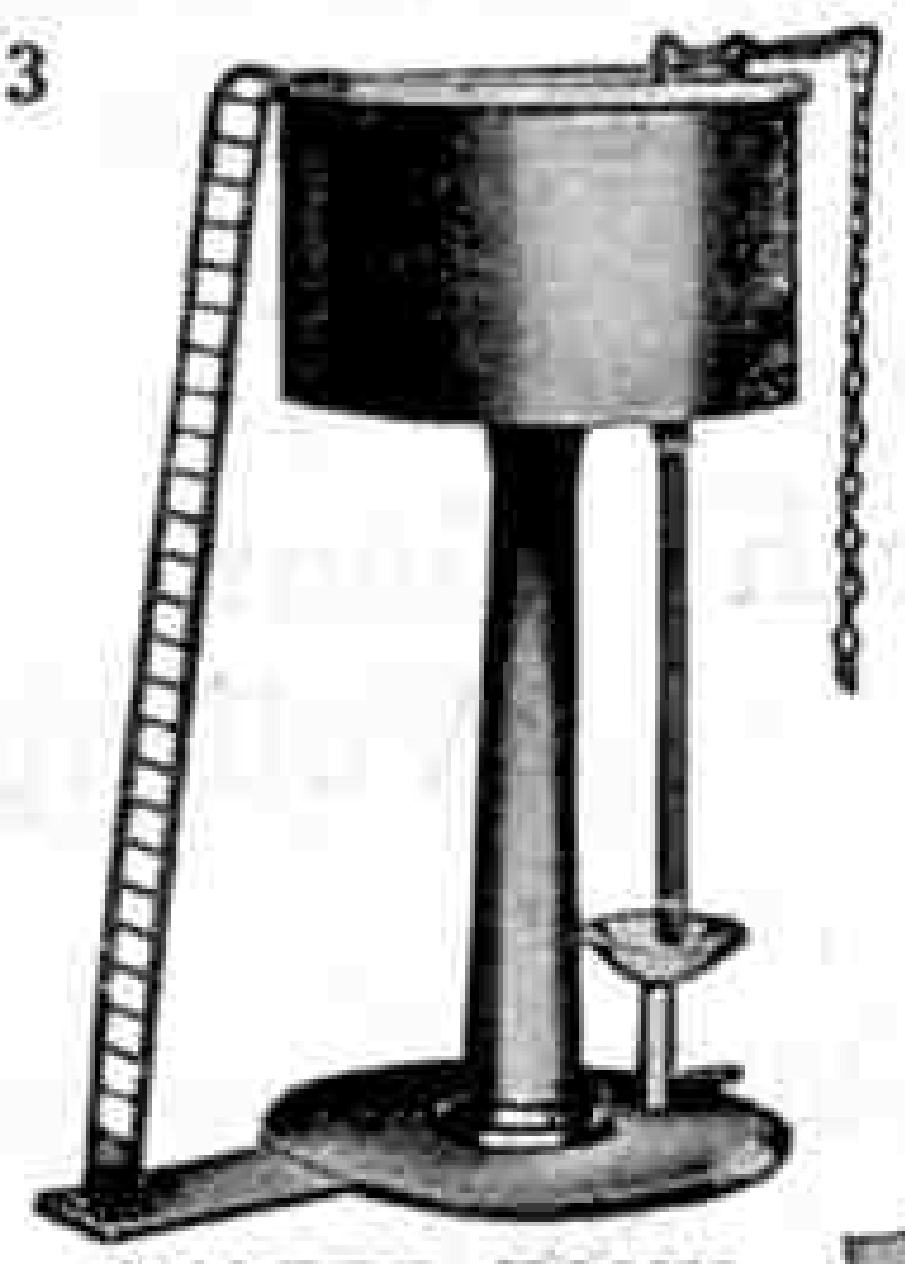
SIGNAL GANTRY
This is a very realistic model, the signal arms of which are operated by levers at the base of the standards. Attractively finished in colours. Price 10/-



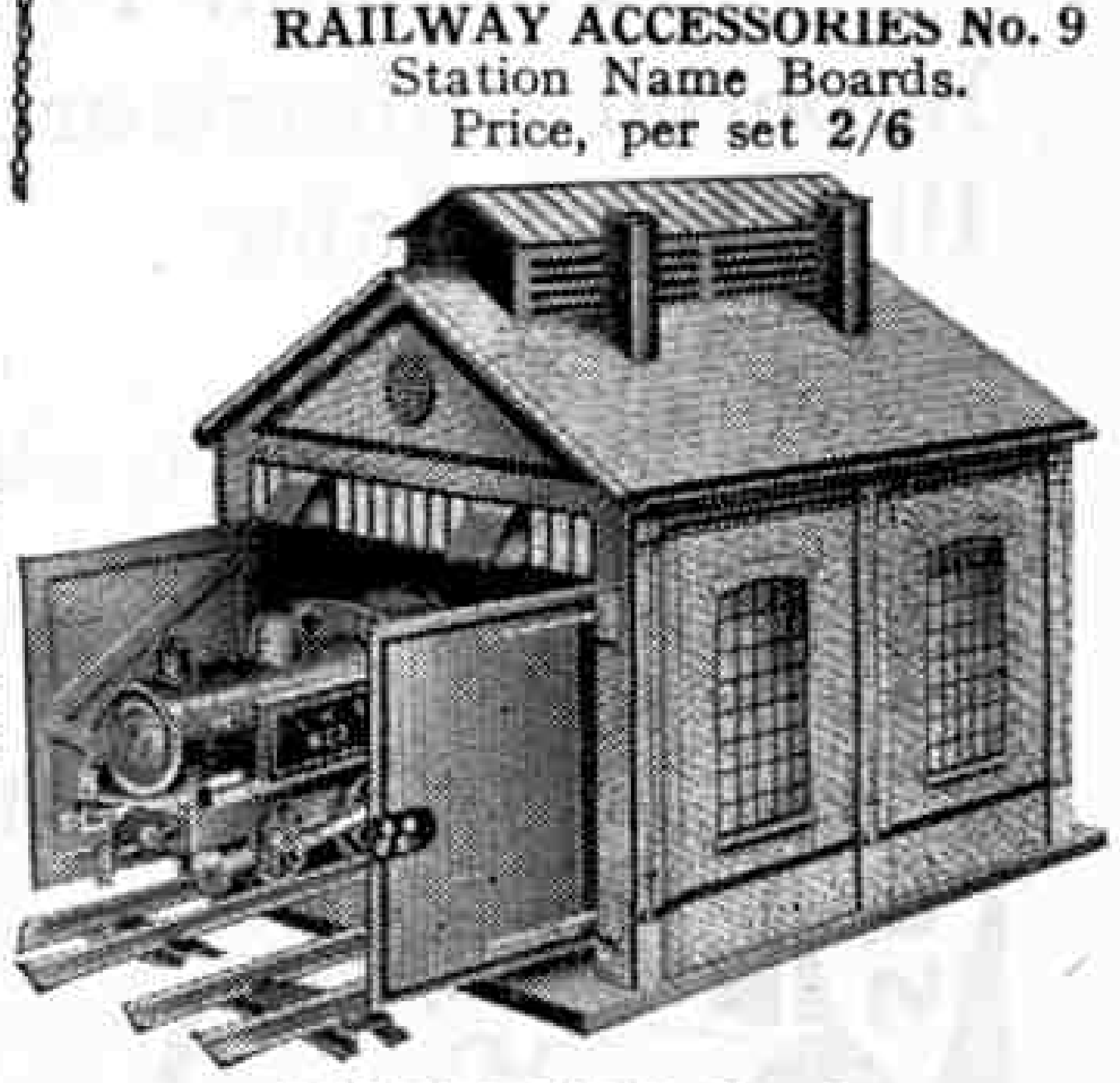
RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker ... Price 1/6



RAILWAY ACCESSORIES No. 5
Gradient Posts and Mile Posts. Price 2/-



WATER TANK
Brightly coloured. Fitted with flexible tube and valve lever.
Price 8/6



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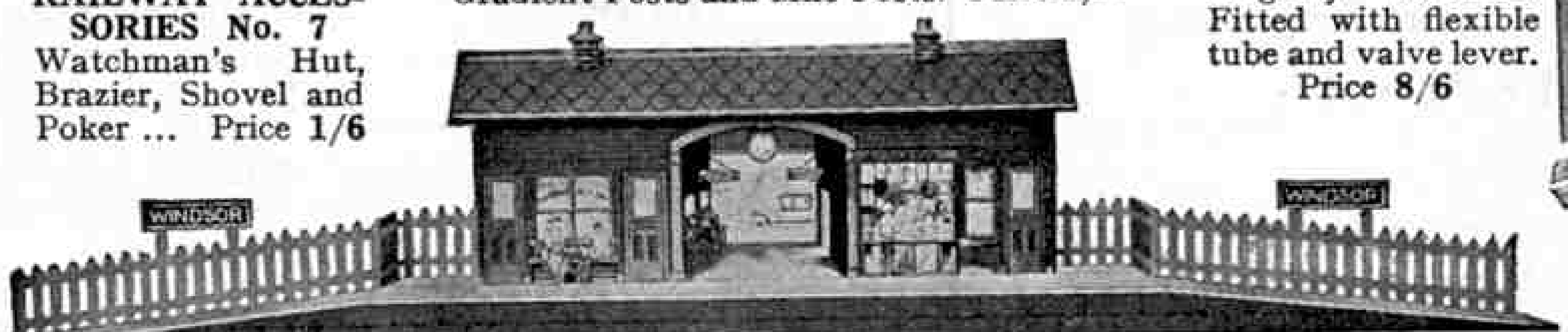
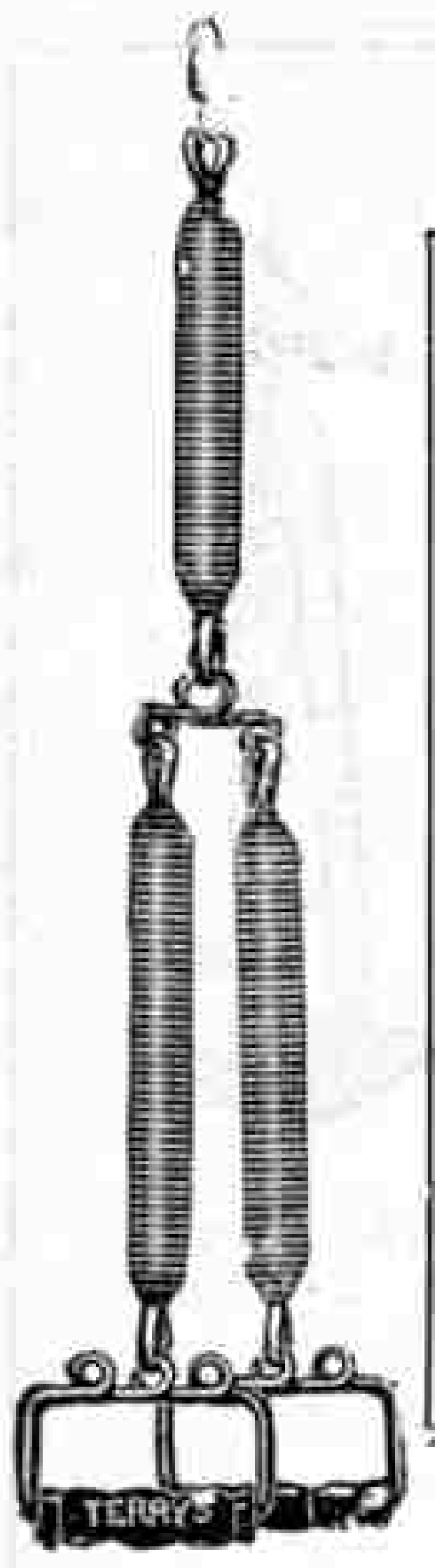
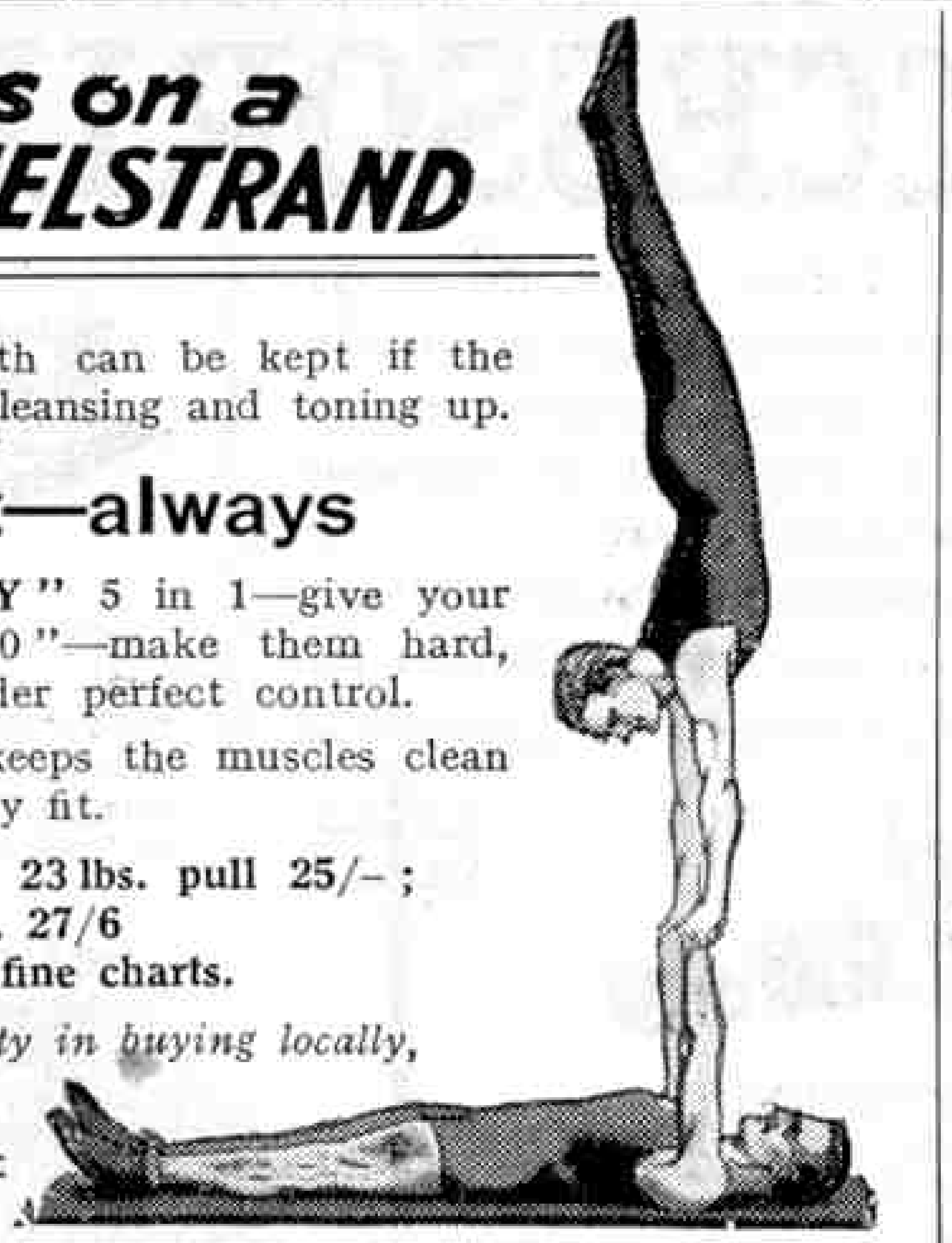
This Shed is beautifully finished in realistic colours. It will accommodate Locomotives and Tenders of the M series, No. 0 and No. 1 types ... Price 15/-



RAILWAY STATION No. 2. Excellent model, beautifully designed and finished. Constructed in three sections, which are detachable. Dimensions: Length 2 ft. 9 ins., breadth 6 ins., height 7 ins. ... ... Price 12/6



10 minutes on a TERRY STEELSTRAND



The balance of health can be kept if the muscles have a daily cleansing and toning up.

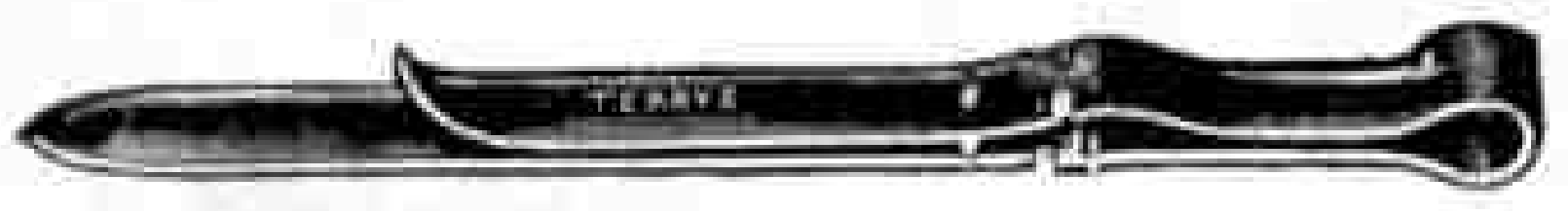
Keep fit—always

—train on a **"TERRY"** 5 in 1—give your muscles the daily "10"—make them hard, tireless, quick and under perfect control.

The daily tone up keeps the muscles clean and your body perfectly fit.

19 lbs. pull 22/6; 23 lbs. pull 25/-; 36 lbs. 27/6 with three fine charts.

If you have difficulty in buying locally, write us. List Free.



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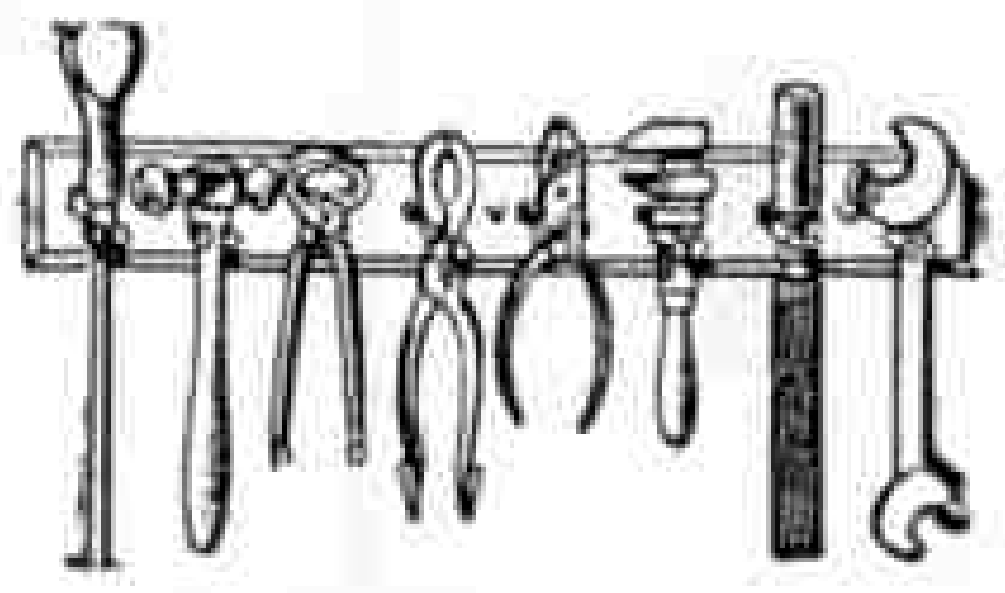
"Dailies" bound like a book in five seconds. Keeps newspapers compact, prevents sheets slipping out. 25 years' reading pleasure for 9d. Also good for binding music. If difficult to get from local trader, send 1/6 for two sample pairs.



No. 305. The "Avecta" workshop or garage Tool Rack. High-grade steel clips. Keeps tools in good condition and bench clear.

4	6	8	10	12 clips
2/3	**3/6**	**4/6**	**5/6**	**6/6** each.

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Smile at miles on a **"TERRY"** Saddle—it will smooth out the miles, make them easier and increase the happy radius of riding. Motor-cycle models, **42/-, 36/6, 30/-**. Cycle models for Lady or Gent., **18/6**. List Free.

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The new range of Meccano Ships' Funnels has become extremely popular with Meccano model-builders. There are 26 funnels in the series representing those of nearly all the principal Shipping Companies. Eighteen of the funnels have already been illustrated and described in the "*M.M.,*" four in the November 1929 issue and seven in each of the January and February 1930 issues.

Details of the final group, composed of eight funnels, are given below. In some cases they represent more than one shipping line and the names of these are indicated.

The Meccano Ships' Funnels are raked and are provided with two perforated lugs by means of which they may be bolted to any Meccano Strip or Plate. They are all beautifully enamelled and finished.

Price 9d. each

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Holland America Line. Buff funnel. White band round middle flanked by two green bands.

No. 138N

Southern Railway, London, Brighton & South Coast Section. White funnel. Broad black band round top.

Also representative of the following:—
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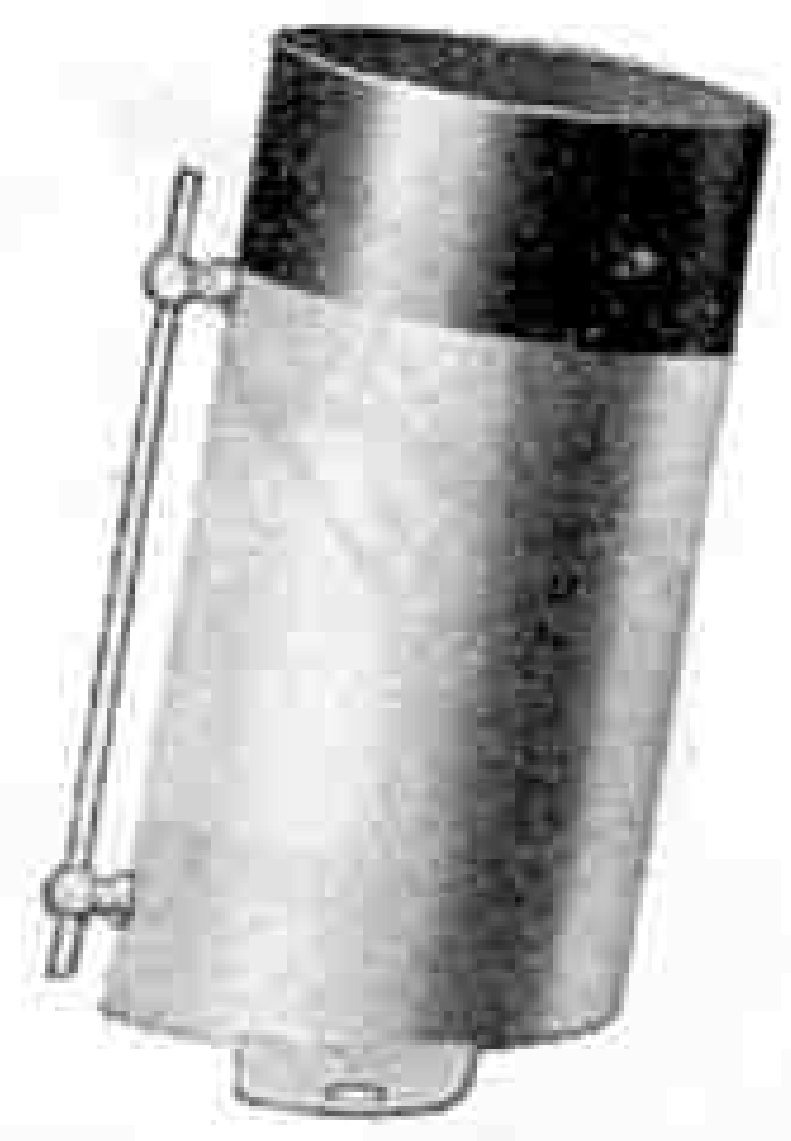
London & North Eastern Railway (Gt. Central Section, Grimsby).
James Westoll.
James Mitchell & Sons.
Dover Navigation Co. Ltd.
Williamson, Buchanan Steamers Ltd., and Turbine Steamers Ltd.
City of Cork S.P. Co. Ltd.
British & Continental S.S. Co. Ltd.

No. 138P

Nelson Line. Red funnel. Broad black band at top with three narrower bands (black band and two white bands) immediately below.



No. 138X

Leyland Line. Pink funnel. Broad black band round top.

Also representative of the following:—
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Haldin S.S. Co.
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No. 138J

Ellerman Line. Buff funnel. Broad black band at top with narrower white band immediately below. The latter is divided from the main buff portion by a thin black band.

Also representative of the following:—
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Ellerman Hall Line.
Ellerman Papayanni Line
Ellerman Lines Ltd. (Westcott & Laurance Line Ltd.)

No. 138M

London & North Eastern Railway Co. Red funnel. Broad black band round top and narrow white band immediately below.

Also representative of the following:—
Sutcliffe & Co. Ltd.
Chr. Salveson & Co., Leith.
Wilson's, & North Eastern Railway Shipping Co. Ltd.

No. 138O

Aberdeen, Newcastle & Hull Steam Co. Black funnel with two narrow white bands.

Also representative of the following:—
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West Australian S.N. Co. Ltd.
Evan Thomas Radcliffe & Co.
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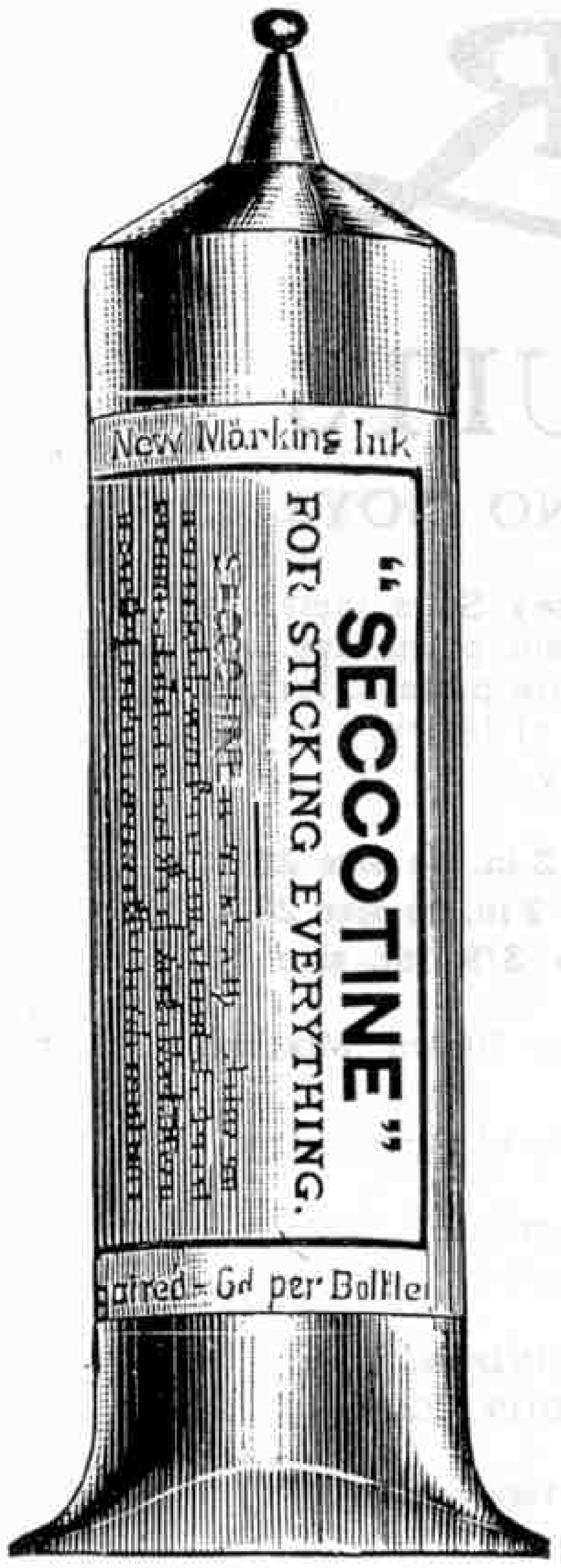
No. 138D

United States Lines. Red funnel. Broad black band at top with white band of same width immediately below.

Obtainable from any Meccano dealer, price 9d., or direct from Meccano Ltd., Liverpool, price 10½d. post free.

MECCANO LTD., Old Swan, LIVERPOOL



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THE TUBE OF

SECCOTINE

The World's Great Adhesive. Registered Trade Mark.

WITH it he can mend a thousand things—his bats, balls, boats, boxes, bags, books, &c. He can make numberless things that a boy likes. He can help his mother by mending breakages in house furniture, anything—everything.

NOTE. There is nothing messy about Seccotine. Use the spike or pin supplied to open a new tube—at top of cone—press gently at end of tube (at folded part) for as much adhesive as is needed—then replace spike or pin which acts as stopper. Keep folding tube end as contents are withdrawn. Give mended article adequate time for drying.

TUBES are 4½d. (vest pocket box), 6d. and 9d. each. Sold everywhere.

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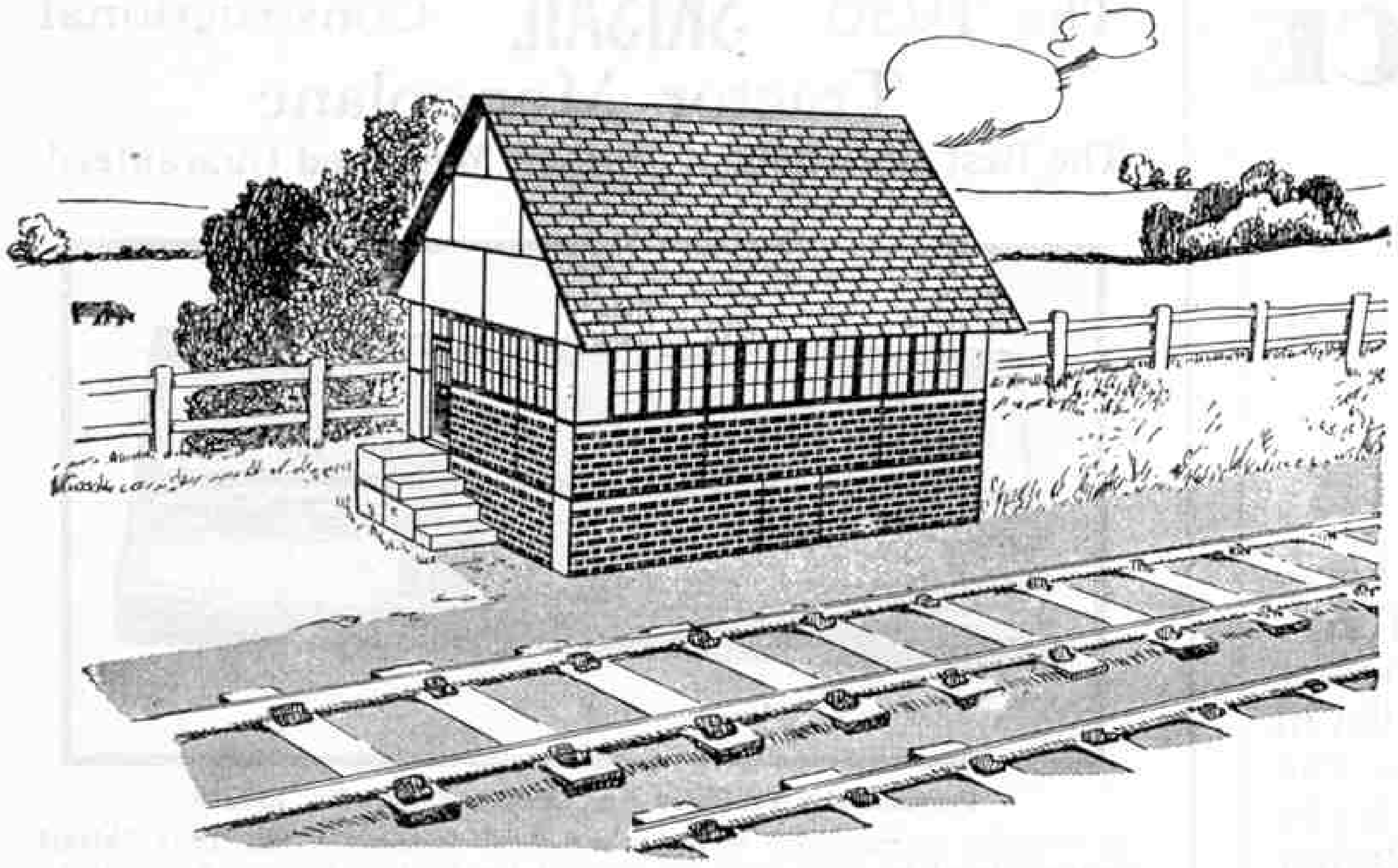
The Linenhall Works BELFAST



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LODOMO

The New Stone Building Bricks

Each Box is complete with Bricks, Roofs, and Plans in Colours for the number of models stated.

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JERSEYS & SUITS

MADE SPECIALLY FOR MECCANO BOYS

The popularity of these useful Jaeger Jerseys and Jersey Suits increases each year. They are made in a variety of suitable plain colourings and marl mixtures. The new design for 1930 is a prominent dice pattern, formed with a contrast shade on the collar, cuffs and base of Jersey. It makes a splendid outfit for the real boy.

Jersey No. BJ169. Chest 22 in., 7/–, rising 9d. every 2 in. to size 30 in.
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¾ Hose. Turnover Tops to match, 2/9 for size 3, to 3/9 for size 10.

Colours—Navy, Steel Grey, Fawn, French Grey, Saxe, Brown Mixture, Fawn Mixture, Saxe Mixture, with neat dice effect on Collars, Cuffs, and at base of Jersey.

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When you dress in a hurry—late, perhaps—it will save time not to have to brush your hair again. Use ANZORA in the morning and ensure the perfect set of your hair throughout the day. ANZORA is the original—British—and still the finest hair fixative.

ANZORA CREAM, for greasy scalps, will not soil hat linings or pillows. ANZORA VIOLA is for dry scalps and contains a little Oil of Violets. Sold in 1/6 and 2/6 (double quantity) bottles by Chemists, Hairdressers, Stores and Boys' Outfitters.

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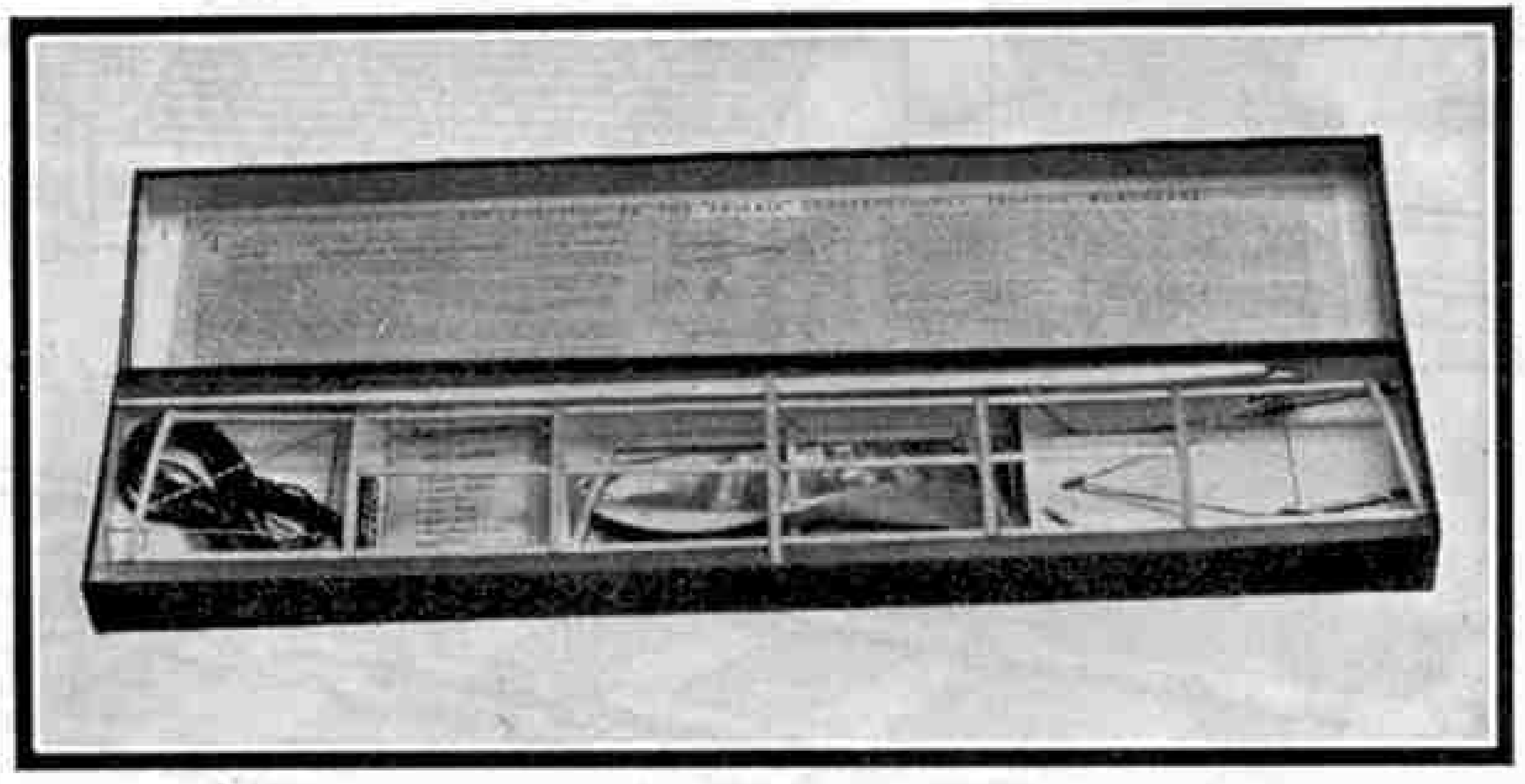

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The **"1930 SKISAIL Constructional Set"** when completed has a Wing Span of 31 ins. and is guaranteed to be a perfect flyer.

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No boy should be without this constructional set for the holidays.

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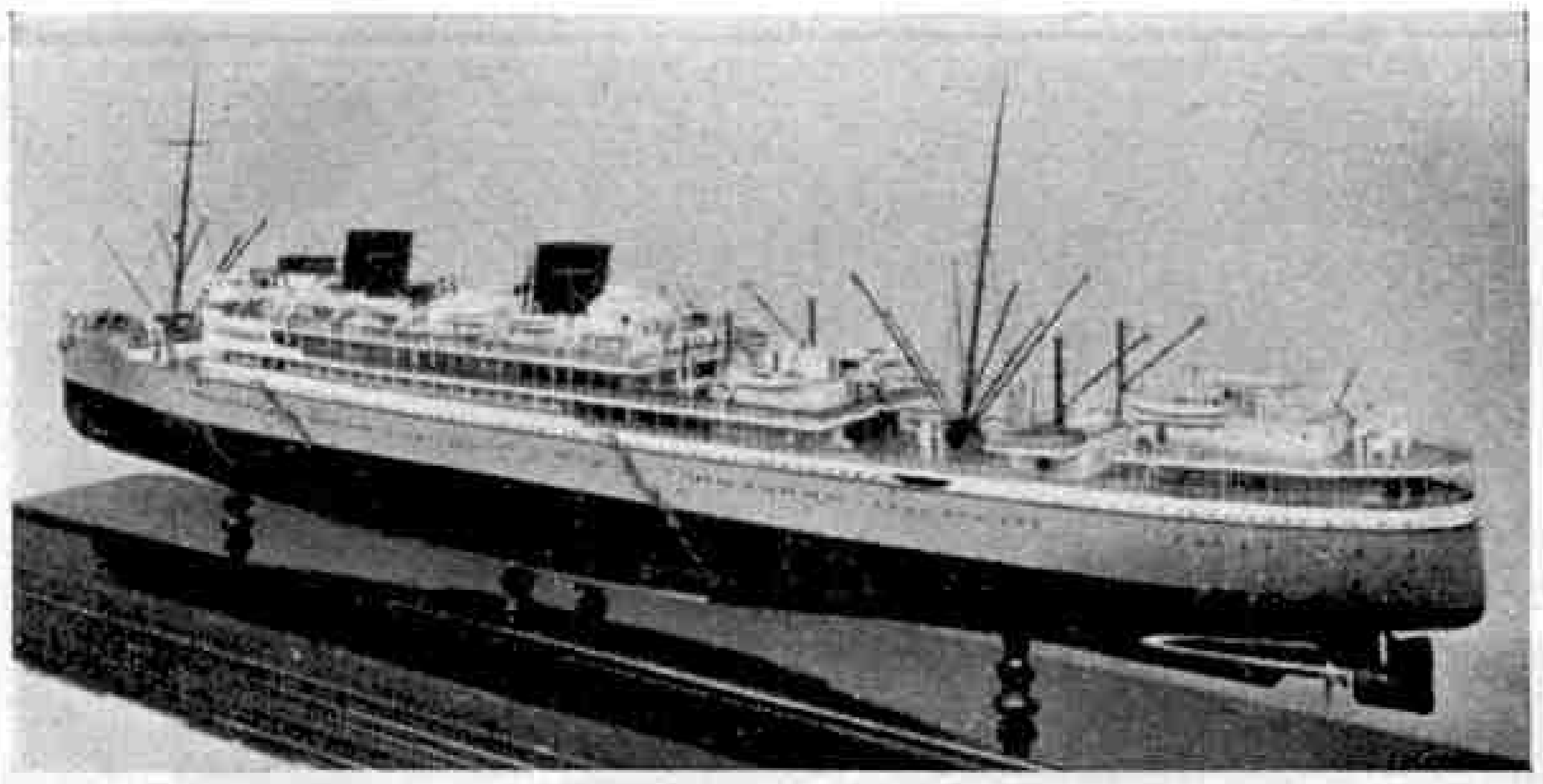

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Height	4 ft.	5 ft.	6 ft.	7 ft.
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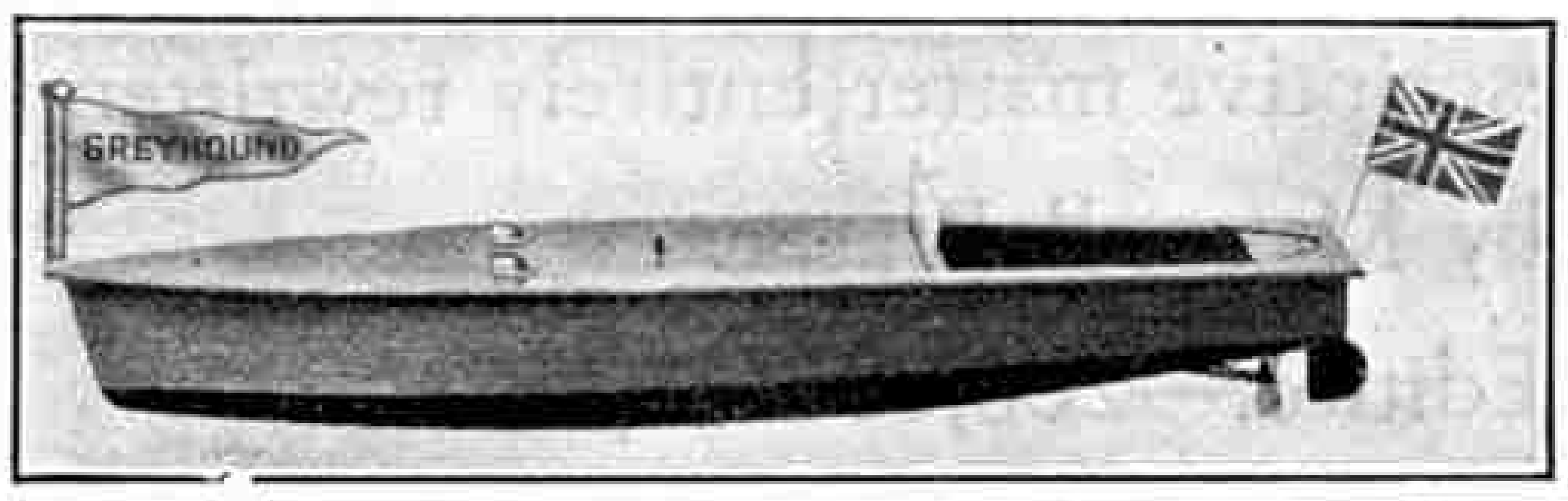

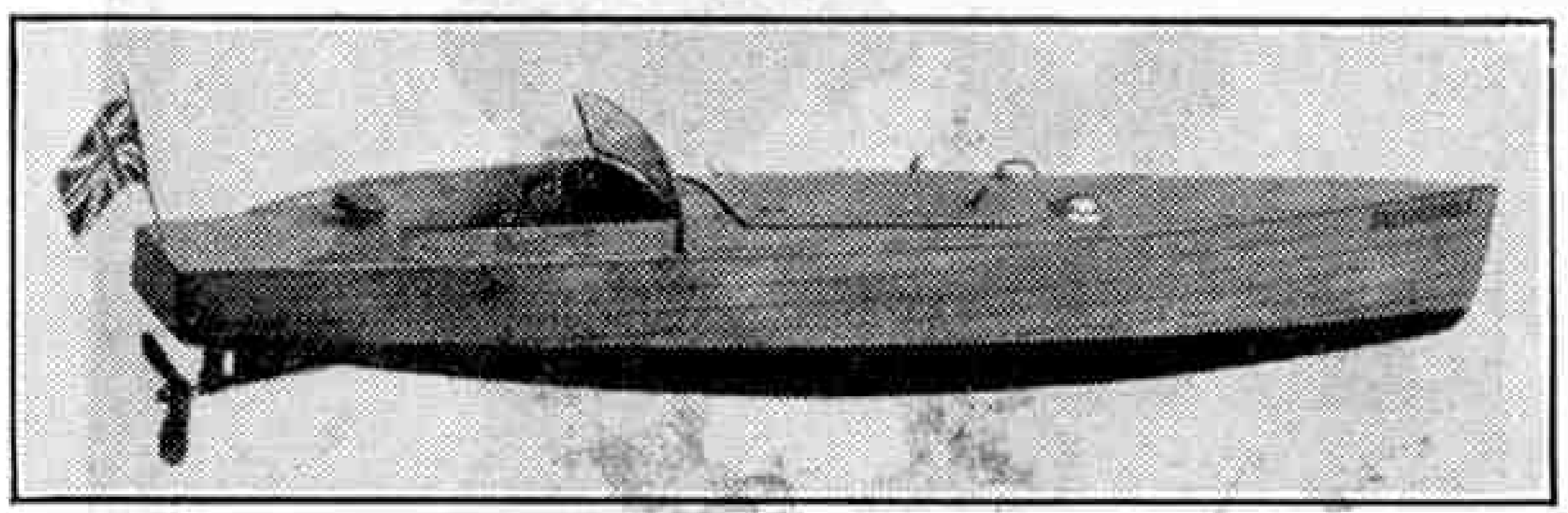

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Greyhound III. 25″ for one Pocket Battery. Retails **25/6**

Greyhound I. 25″ {2 Pocket Batteries 2-Speed} **35/-**

A. J. HOLLADAY & CO. LTD., 3, Aldermanbury Avenue, LONDON, E.C.

Stocked by all leading Stores and Dealers: If unable to procure, write us!

ANOTHER FINE MODEL AEROPLANE CONSTRUCTION SET THE S.E. 5A SINGLE SEATER MODEL BIPLANE

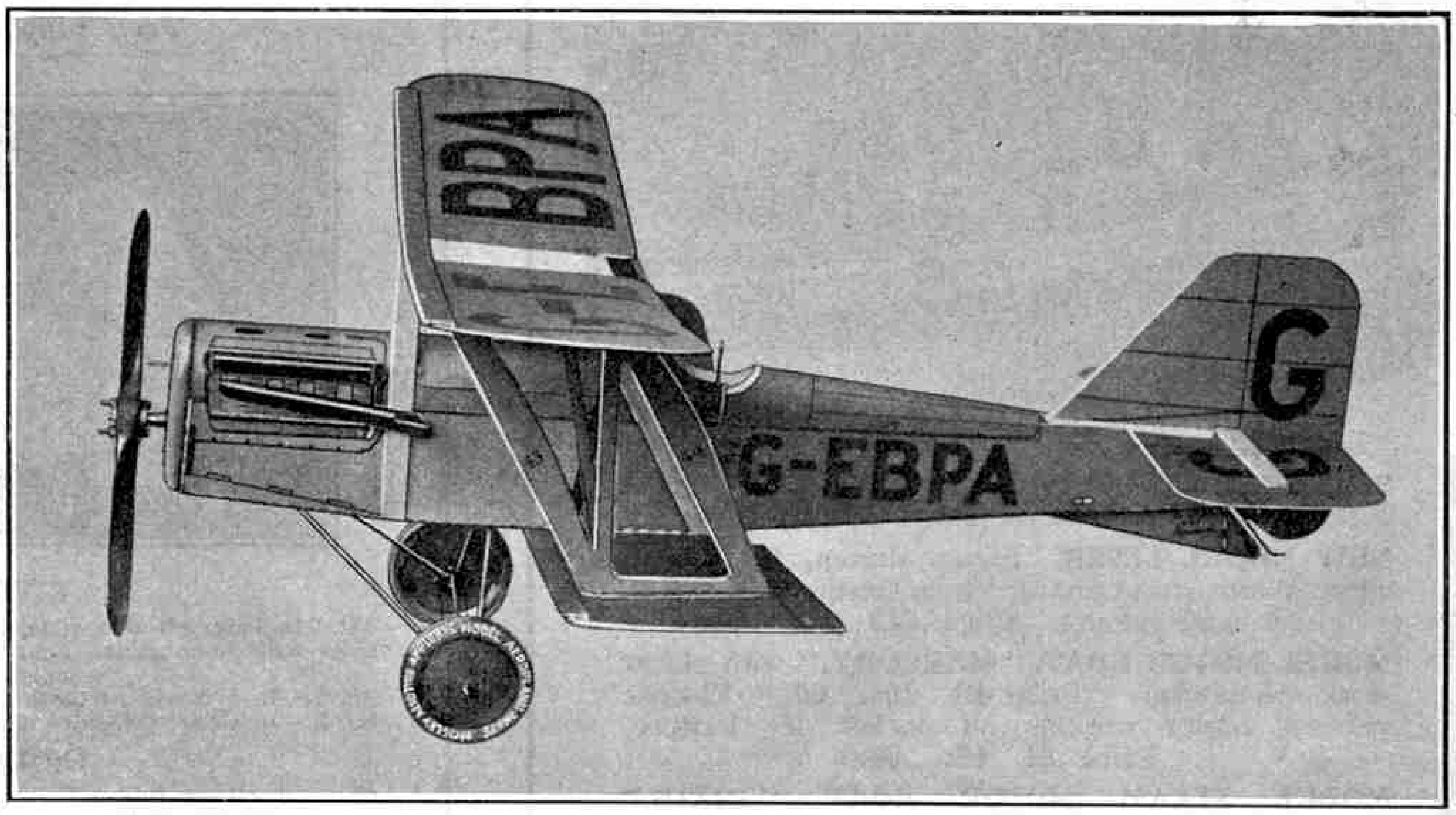
This Model is the last word in Model Aeroplane design and construction. It will rise off the ground in a most realistic manner under it's own power.

The Propeller and Motor have been re-designed to give the utmost efficiency and a small Working Joy Stick is fitted in the Cockpit to make the take-off fool-proof. The Propeller is fitted with correct pattern Boss and Locking Plates just like a real Aeroplane. This has never previously been incorporated in any Model Aeroplane at such a price.

The Chassis is metal throughout and fitted with real Elastic Shock Absorbers, which allow the wheels to take the shock off a heavy landing.

The Aluminium Disc Wheels are fitted with miniature "Mosley" Aeroplane Tyres. There are a lot of other new ideas incorporated in the Model. The length of the Model is 14½″.

All you have to do is to erect the parts from the profusely illustrated 16-page book of Instructions and Working Drawings.



Complete set of Cardboard Parts, Metal Fittings and Components packed with Box and Instructions

PRICE **3/-**

Postage and packing - **6d.**
Postage Abroad **1/10**

You can get the above set at most Toy Shops, or if you have any difficulty send your order direct to us enclosing Postal Order to the value of 3/6 (abroad 4/10) and you will receive your set per return.

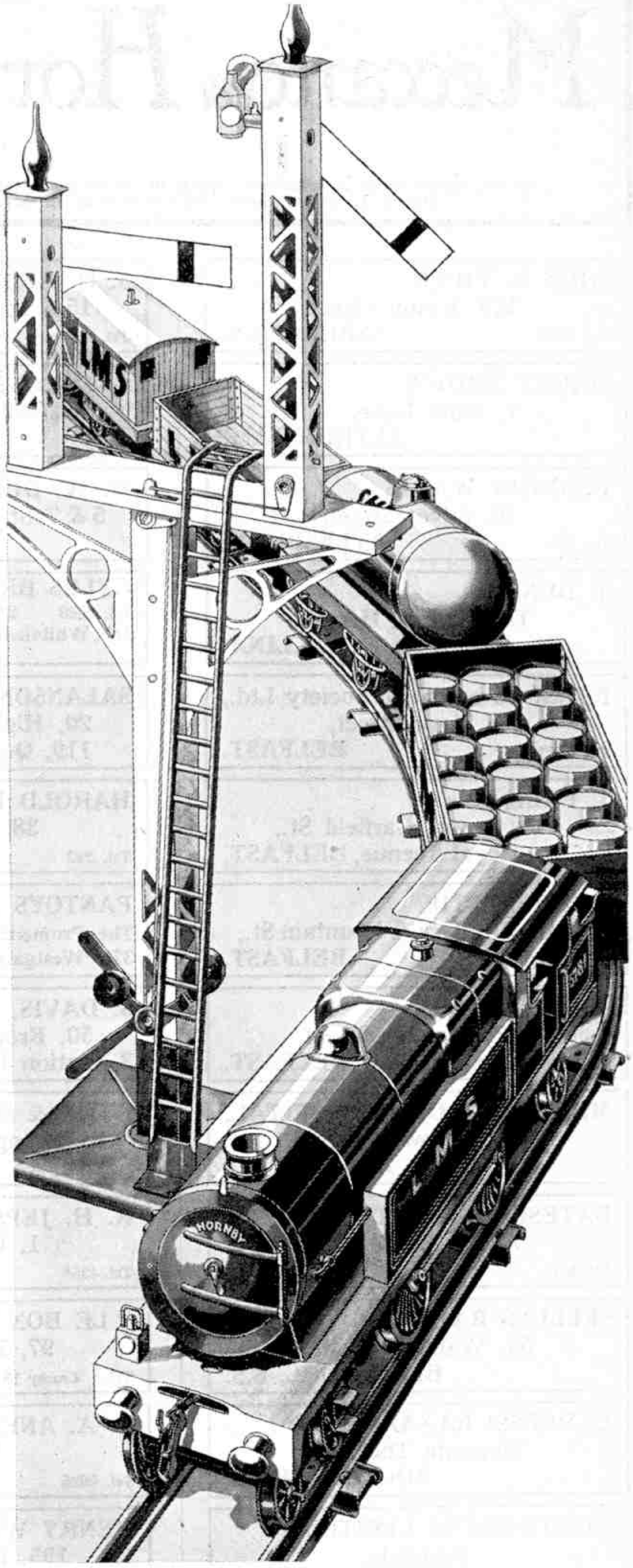
WILLIAM E. APPLEBY (N/C) & CO., Dept. C., 217-219, Jesmond Road, NEWCASTLE-ON-TYNE

BOYS! KEEP YOUR HORNBY RAILWAY UP–TO–DATE

The big railways are constantly making improvements and additions to ensure greater efficiency in their rolling stock and equipment—so also is the Hornby railway. Boys, bring your Hornby railway up to date! The magnificent new models of L.N.E.R., L.M.S.R., G.W.R. and S.R. Locomotives are fitted with double-power mechanisms for longer runs and bigger freights. The new accessories and rolling stock are of the latest types, all built in perfect proportion and all beautifully finished in correct colours.

Playing the great game of railways with a Hornby Train is now more than ever the best fun in the world. The comprehensive range of Hornby Rolling Stock, Accessories, Rails, Points and Crossings enables a boy to duplicate almost every operation employed in modern railway practice.

All Hornby Locomotives—clockwork and electric—are thoroughly tested before leaving the factory and each one is guaranteed. The thrill and fascination of a Hornby Railway are real and lasting because a Hornby Railway is A REAL RAILWAY IN MINIATURE.



PRICES OF HORNBY TRAINS

CLOCKWORK

M0 Passenger Set...	6/–
M1 Passenger Set...	7/6
M Goods Set	8/6
M2 Passenger Set...	9/–
No. 0 Goods Set...	15/–
,, 0 Passenger Set	15/–
,, 1 Goods Set	20/–
,, 1 Tank Goods Set	22/6
,, 1 Passenger Set	25/–
,, 1 Special Goods Set	32/6
,, 1 Special Passenger Set	35/–
,, 2 Mixed Goods Set	40/–
Metropolitan Train Set C	55/–
No. 3C Train Set. Riviera " Blue "	62/6
,, 2 Special Pullman Set	67/6
,, 3C Train Sets. " Flying Scotsman," " Royal Scot," " Cornish Riviera " or " Continental Express "	67/6

ELECTRIC

No. 3E Train Set. Riviera " Blue " (6-volt) ...	80/–
,, 3E Train Sets (6-volt). " Flying Scotsman," " Royal Scot," " Cornish Riviera " or " Continental Express "	85/–
Metropolitan Train Set, L.V. (6-volt)	95/–

HORNBY TRAINS

MANUFACTURED by · MECCANO LIMITED · OLD SWAN · LIVERPOOL

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on the following three pages carry full stocks of Meccano Outfits, Accessory Outfits, and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

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SPORTS DEPOT,
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Tel. 4554 (Nr. Albert Memorial) BELFAST.

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68, Darwen Street,
BLACKBURN.

BATESON'S SPORTS DEPOT,
Abingdon Street,
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SELLENS BAZAAR,
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BURGESS' BAZAAR,
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Tel.: Crosby 1533 CROSBY.

E. A. ANELAY,
Parkgate,
Tel. 2925 DARLINGTON.

HENRY WHALLEY,
195, Duckworth Street,
7, Bolton Road, DARWEN.

RANBY'S LTD.,
Victoria St. & Green Lane,
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DIXON'S,
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Tel. 5810 DUNDEE.

MARTINS',
232, Hilltown,
DUNDEE.

SMITH BROTHERS,
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DUNDEE.

A. GOODWIN,
140, Church Street,
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H. POULTON, Toyland,
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VIRGO'S Toy and Sports Stores,
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YE OLDE TOY SHOPPE,
Chariot Street,
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PEARSON & DENHAM (PHOTO) LTD., 6, Bond Street,
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LEICESTER.

ROBOTHAM'S LIMITED,
"Baby's Kingdom,"
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J. T. WEIGHTMAN,
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PERCIVAL & CO.,
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HENRY'S Toy & Game Stores,
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A. INMAN, MANCHESTER.
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Opposite Town Hall,
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LAWSONS LTD.,
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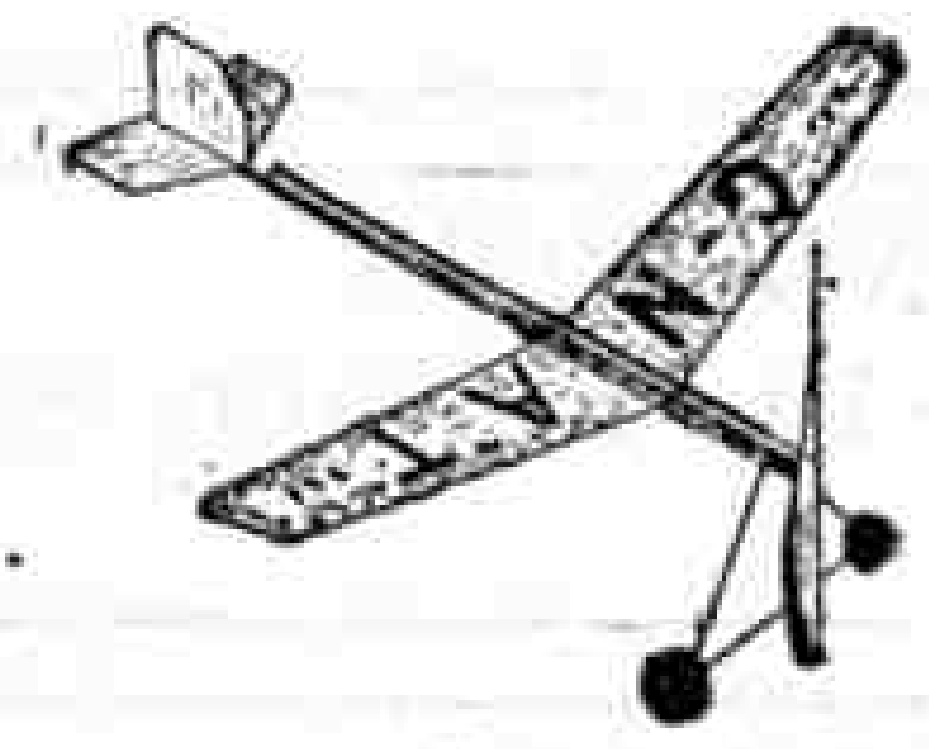
Guaranteed to Fly

THE "GNAT" NIPPY STUNTER.

D.A.P. MODEL AEROPLANE

Awarded Gamage Challenge Cup, 1927, 1928, 1929.

Loops the Loop.
Tractor Model.
Rises from Ground.



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Post Paid U.K.

Well boxed. Full instructions.
Full List of other Models—1½d. Stamp.
D. CABELDU, 371, High Street, Lewisham, S.E.13.

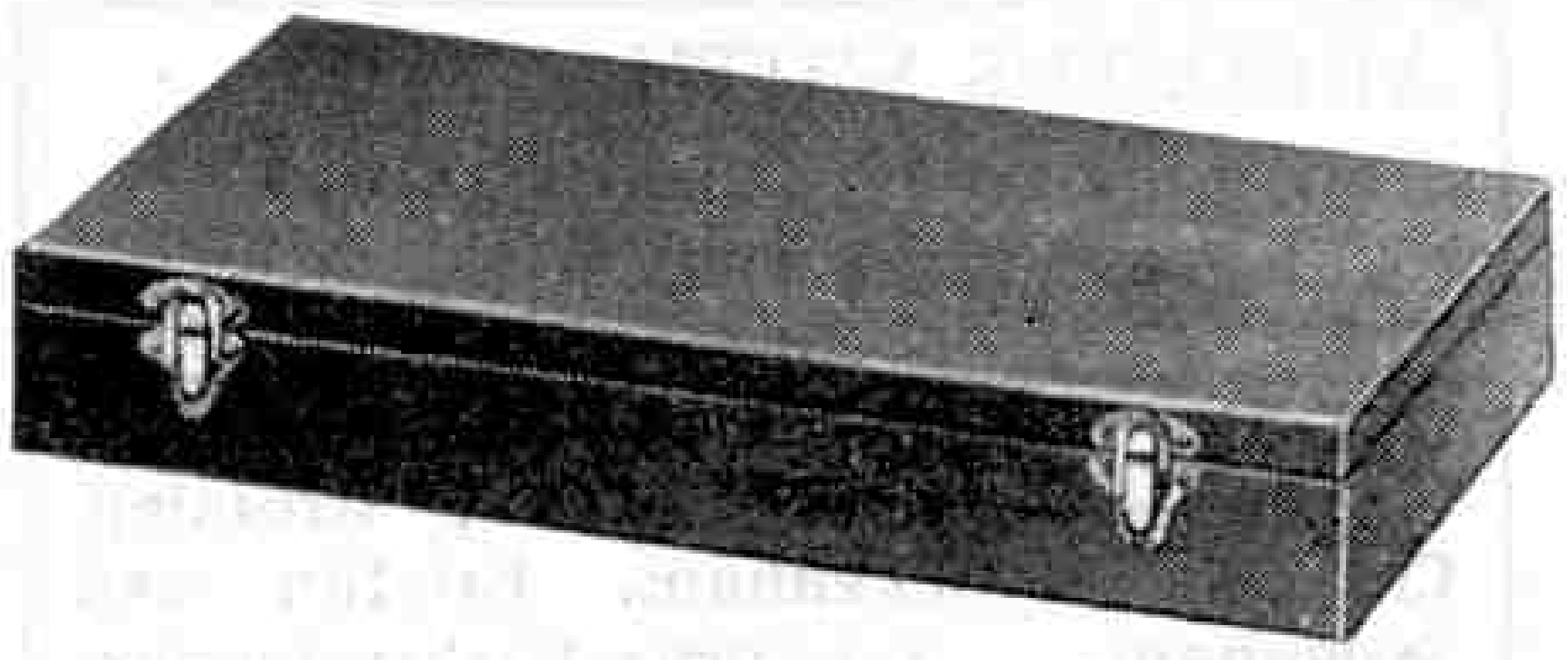
MAKE your own GRAMOPHONE at a ¼ the price. Buy only Mechanical Set as shown, namely: British double spring motor, 12" velvet turntable. "S" neck tonearm, latest metal Soundbox, shaped internal horn, or cast throat, and needle cups for **£1/18/6,** post free in U.K. Machines sold by other firms at **£10-£20,** do not contain better fittings than these. We also sell cabinets for this set. Portable Gramophones from **19/6.** Postage **1/6.** Mechanical Sets **18/-.** Motors, **8/6.** Accessories, Accordeons, Violins. Lists Free. 64 pp. 1930 Catalogue, **How to make Gramophones, 3d.** Established 25 years. Thousands of Testimonials. **Regent Fittings Co., 78D, 120, Old St., London, E.C.1**

No. 815. Tubular 2-wing horn 17/- post paid.

DAN MORGAN, The Meccano Centre,
218, Oxford St.,
Tel. 2346 SWANSEA.

GOLDSMITH'S,
18, High Street,
Tel. 392 SWINDON.

Storage Boxes



We have for disposal a number of useful wooden boxes. Although these boxes may be used for a variety of purposes, they are particularly useful for storing Meccano parts.

The boxes are strongly made, enamelled both inside and outside in an attractive shade of green, and fitted with two strong spring clasps.

Price 5/9, post free.

Meccano Ltd., Old Swan, Liverpool.

E. M. COLLINS,
12, Lower Castle Street,
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CHAMBERLAIN'S,
Stationers, Newsagents, Tobacconists,
57 & 59, Albert Road, WIDNES.

W. JACKSON,
56 & 58, High Road,
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Model Railway Exhibition

Locos., Coaches, Wagons, Signals, Permanent Way, etc.

Working Models in all Gauges.

Steam - Electric - Clockwork.

The work of Members of The Model Railway Club.

KINGSWAY HALL,

23rd to 26th APRIL, 1930.

Admission—Adults (including Tax) 1/2. Children (under 12) 6d.

BOYS. **A WELL-MADE FLYING MODEL,** 20" span, that is guaranteed to fly 600 feet, **3/6,** postage 6d. Satisfaction guaranteed.

Set of constructional parts, **1/6.**

Any boy can make it.

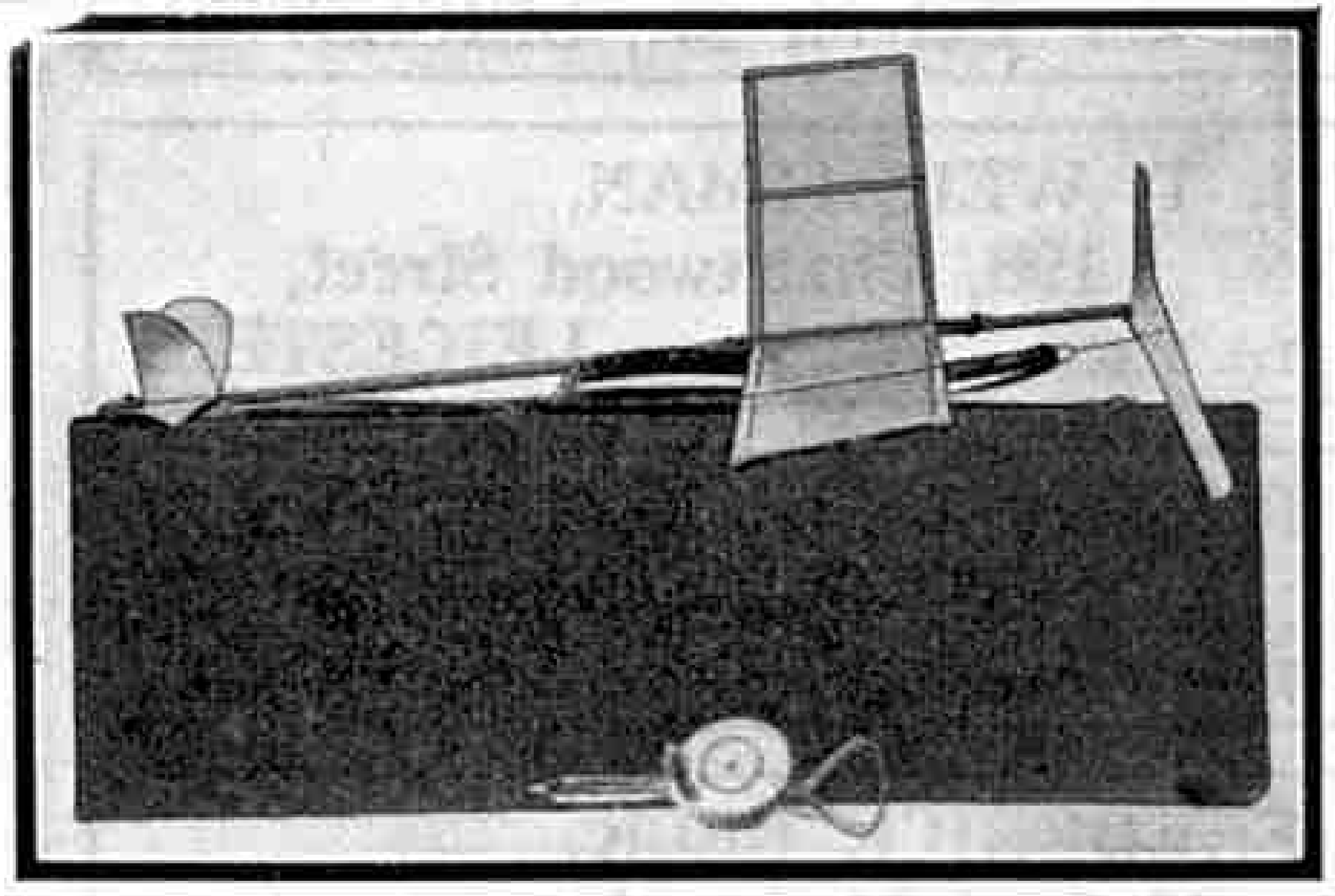
Carrying Case for same, **3/6,** postage 6d.

Geared Winder for elastic machines, wind your model in a few turns. Price **1/6,** postage 3d.

Xactus Construction Sets, 1/40th scale Model Aeroplanes.

Series		Series	
1. Moth ...	**6/6**	4. Blackburn Bluebird	**6/-**
2. W. Widgeon	**5/-**	5. Desoutter Coupé ...	**6/-**
3. S.6	**8/-**		

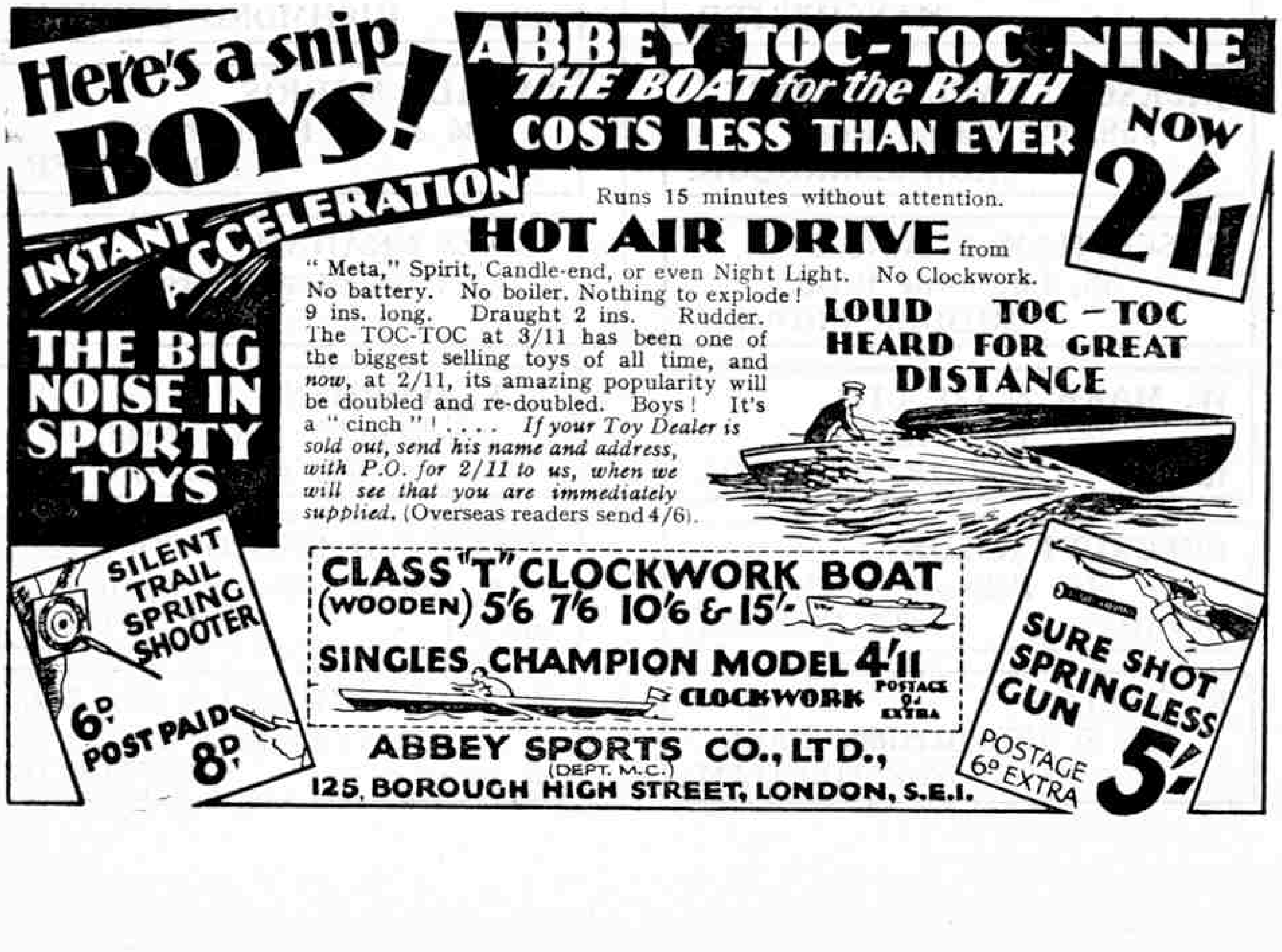
Cheaper Series—1B **2/6** Moth. 2B **2/6** Avro Avion.



Jig Saw Aero Photograph Puzzles of London. Exceedingly interesting, and more difficult than any other Jig Saw Puzzle, **2/6,** postage 4d.

One agent wanted in every school in England. Write for particulars, and secure the agency in your school.

W. H. LANE, 162, SYDENHAM ROAD NORTH, CROYDON.



Here's a snip BOYS!

ABBEY TOC-TOC NINE

THE BOAT for the BATH

COSTS LESS THAN EVER

NOW 2/11

INSTANT ACCELERATION

THE BIG NOISE IN SPORTY TOYS

Runs 15 minutes without attention.

HOT AIR DRIVE from "Meta," Spirit, Candle-end, or even Night Light. No Clockwork. No battery. No boiler. Nothing to explode! 9 ins. long. Draught 2 ins. Rudder. The TOC-TOC at 3/11 has been one of the biggest selling toys of all time, and *now*, at 2/11, its amazing popularity will be doubled and re-doubled. Boys! It's a "cinch"! . . . . *If your Toy Dealer is sold out, send his name and address, with P.O. for 2/11 to us, when we will see that you are immediately supplied.* (Overseas readers send 4/6).

LOUD TOC-TOC HEARD FOR GREAT DISTANCE

SILENT TRAIL SPRING SHOOTER 6D. POST PAID 8D.

CLASS "T" CLOCKWORK BOAT (WOODEN) 5/6 7/6 10/6 & 15/-

SINGLES, CHAMPION MODEL 4/11 CLOCKWORK POSTAGE 9d EXTRA

SURE SHOT SPRINGLESS GUN 5/- POSTAGE 6D EXTRA

ABBEY SPORTS CO., LTD.,
(DEPT. M.C.)
125, BOROUGH HIGH STREET, LONDON, S.E.1.

L. B. W.!

Don't put your leg before the wicket—hold a good Bat there instead!

BUY A GENUINE

"WILFRED RHODES"

Autograph Cricket Bat

PRICE only 15/- Post Free.

Each one specially selected.

Rubber Grip 1/- extra.

Please state if size 4, 5, 6 is required.

Get yours now from

JEPSON'S SPORTS DEPOT,
Broad Gate, Coventry.

Revised Prices

The prices of a number of Meccano Outfits, Hornby Train Sets, Hornby Rolling Stock and Accessories have been revised as indicated below.

MECCANO

COMPLETE OUTFITS	s.	d.
No. 4 Outfit ...	52	6
„ 5 „ (Carton)	70	0
„ 5 „ (Cabinet)	100	0
„ 6 „ (Carton)	125	0
„ 6 „ (Cabinet)	155	0
„ 7 „ „	450	0

ACCESSORY OUTFITS, ETC.	s.	d.
No. 3a...	26	0
„ 4a...	17	6
„ 5a (Carton)	55	0
„ 5a (In a No. 6 Cabinet)	97	6
„ 6a (Cabinet)	235	0
Resistance Controller	4	6
Meccano Steam Engine	25	0

NOTE :—The Special Inventor's Outfit has been withdrawn.

MECCANO ACCESSORY PARTS.

No. 37 Nuts and Bolts, 7/32", per box (doz). **4d.**
No. 37a Nuts, per box (doz). **2d.**
No. 37b Bolts, 7/32", per box (doz). **2d.**

HORNBY TRAINS

TRAIN SETS (CLOCKWORK).	s.	d.
No. 1 Special Goods ...	32	6
„ 1 „ Passenger ...	35	0
„ 2 „ Pullman ...	67	6
„ 2 Mixed Goods	40	0
„ 3C Pullman	67	6
TRAIN SETS (ELECTRIC).		
No. 3E Pullman, L.M.S., L.N.E.R., G.W. or S.R.	85	0
„ 3E Riviera " Blue " ...	80	0
LOCOMOTIVES.		
No. 1 Special	18	0
„ 2 „	27	6
„ 1 Tank Special	18	0
„ 2 „ „	25	0
„ 3E L.M.S., L.N.E.R., G.W. or S.R.	40	0
„ 3E Riviera " Blue " ...	40	0

TENDERS.	s.	d.
Riviera " Blue "	5	6
No. 1 Special	3	6
„ 2 „	6	6
COACHES.		
No. 1 Pullman	3	6
„ 1 „ Composite ...	4	0
* „ 2 Special Pullman ...	15	0
* „ 2 „ „ Composite	16	0
Riviera " Blue "	14	0
ROLLING STOCK.		
Bitumen Tank Wagon "Colas"	5	3
Cattle Truck No. 1	3	3
Covered Wagon	3	0
Guard's Van	3	0
Gunpowder Van	3	6
Hopper Wagon	3	6
Milk Tank Wagon	6	0
Trolley Wagon	4	6
Wine Wagon, Single Barrel	4	0
„ „ Double „	5	0

ACCESSORIES.	s.	d.
Buffer Stops No. 2	5	6
Engine Shed No. 1	15	0
„ „ „ 2	22	6
Footbridge No 1	4	0
„ „ 2	7	6
„ „ 3 (Lattice Girder)	12	6
Lamp Standard No. 1 ...	3	6
„ „ „ 2 ...	4	6
Level Crossing No. 2 ...	5	6
Loading Gauge	2	3
Platform Crane	4	9
„ Goods	12	6
Ramps, pairs	2	6
Shunter's Pole	0	3
Signals No. 1, pairs	3	3
„ Double Arm, No. 1, pairs	4	3
Signal, Junction	6	0

	s.	d.
Signals for Footbridge No. 2, pairs	3	9
Signal Cabin No. 2	5	6
Station No. 1...	6	0
„ „ 2...	12	6
Tarpaulin Sheet	0	3
Telegraph Poles, pairs ...	4	0
Turntable No. 1	2	9
„ „ 2	4	6
Viaduct Centre	4	9
„ „ Electric ...	5	3
Water Tank	8	6
RAILS, ETC.		
DS1 Straight rails, double track ... ... ½ doz.	6	6
DC2 Curved rails, double track (2 ft. radius) ... ½ doz.	7	6
Crossings, CA1 and CR1 each	2	0
„ CA2 and CR2 „	1	9
PSR2 and PSL2, Points on solid base (2 ft. radius) pairs	8	6

NOTE :—The No 2 Special Goods Set has been withdrawn.
*Previously known as No. 2/3 Pullman Coaches.

MECCANO LIMITED OLD SWAN LIVERPOOL

Storage Boxes for Meccano Parts

Almost every Meccano boy purchases additional Meccano parts from time to time, but there is sometimes difficulty in finding suitable accommodation for them. We supply strongly made boxes that have been specially designed for the purpose, enabling such extra parts to be stored neatly and methodically so that they are always easily accessible. There are three different sizes, each of which is illustrated and described below.

No. 1

No. 1 STORAGE BOX

Attractively enamelled in red, and fitted with partitions as shown in the illustration. The lid is hinged and is secured by means of lock and key.

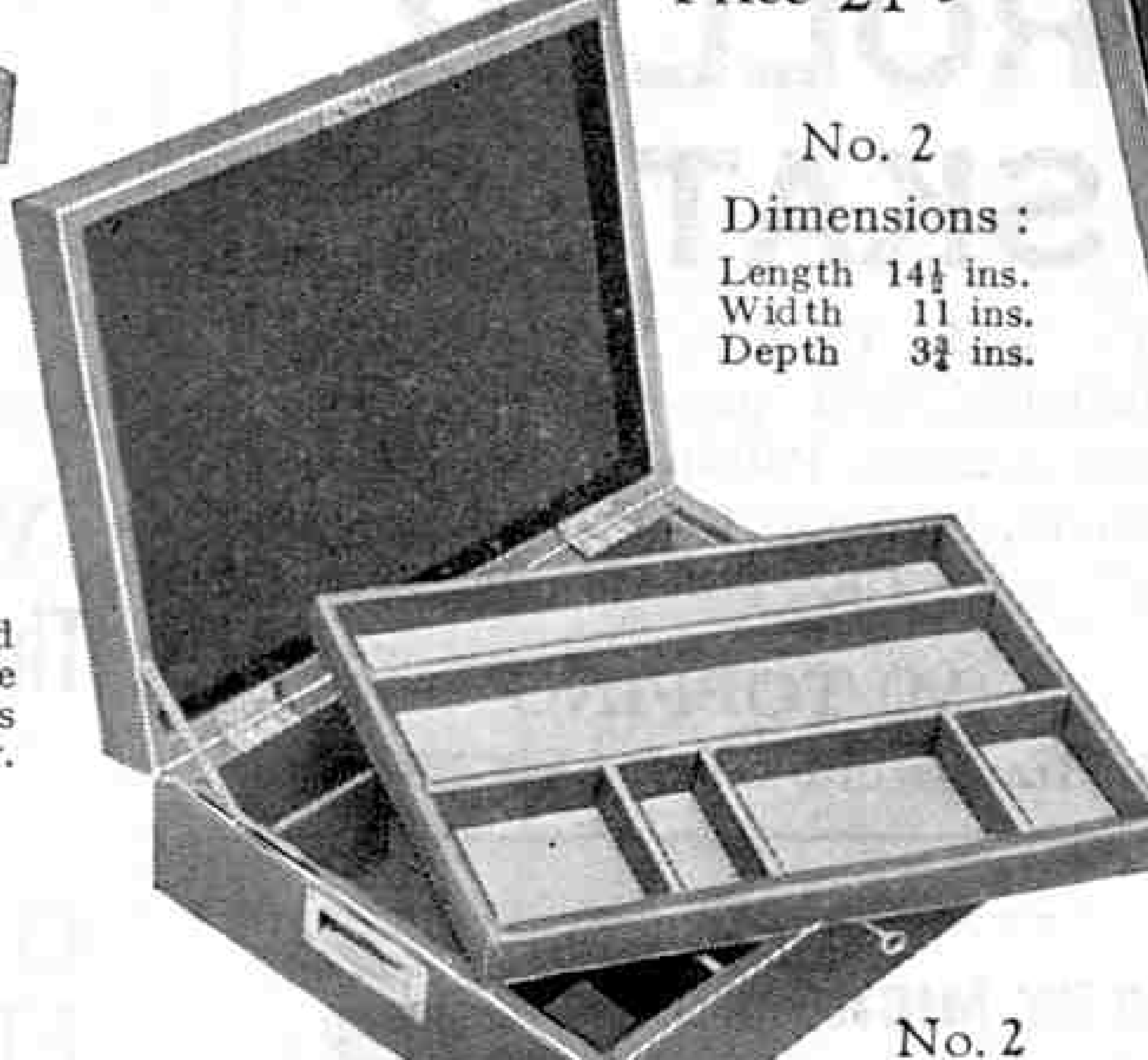
Price 10/6

Dimensions:
Length 15½ ins.
Width 8¾ ins.
Depth 2¾ ins.

No. 2 STORAGE BOX

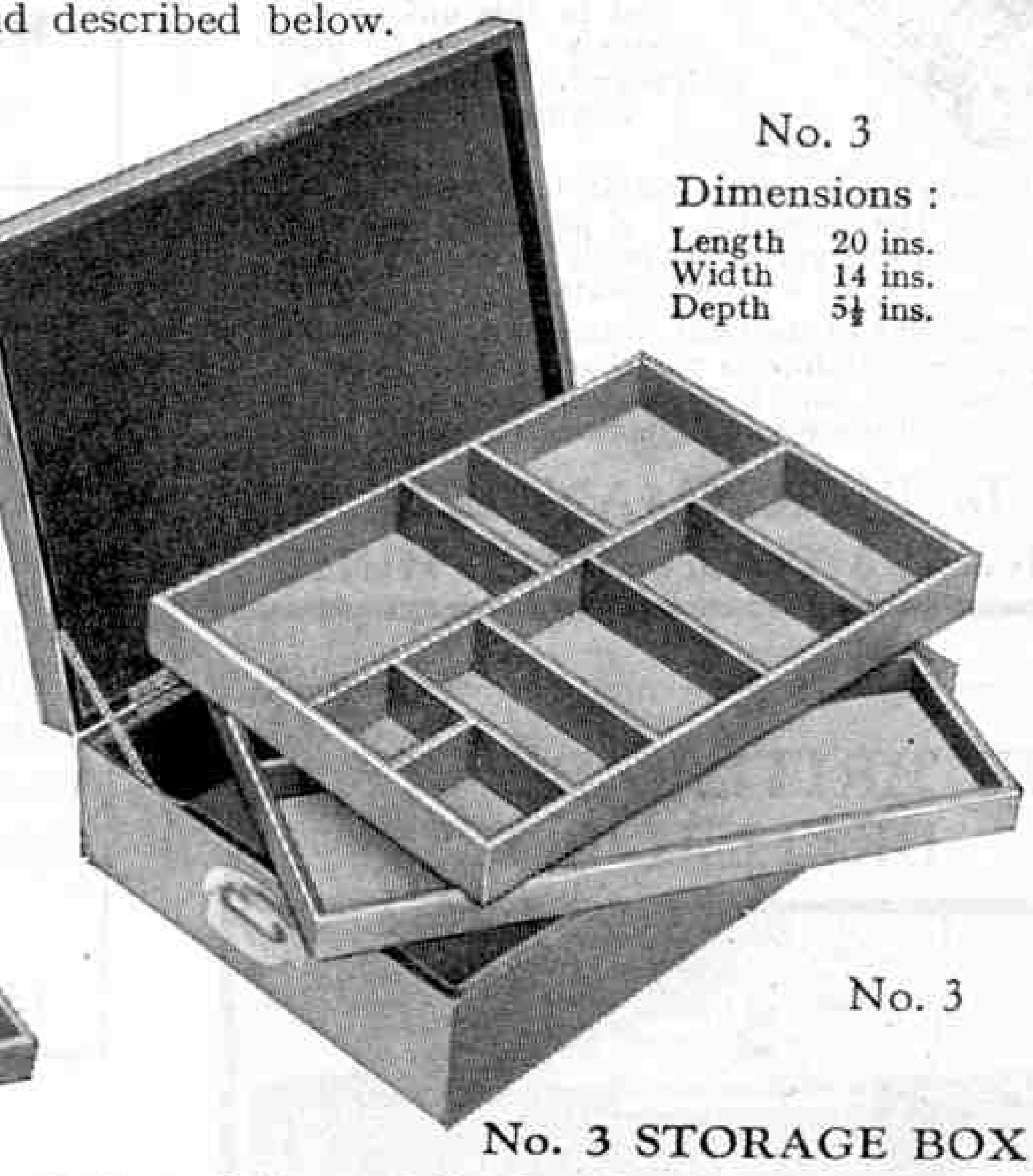
Finished as No. 1 Box and provided with lock and key. The tray with which it is fitted enables a much larger quantity of parts to be accommodated.

Price 21/-



No. 2

Dimensions :
Length 14½ ins.
Width 11 ins.
Depth 3¾ ins.



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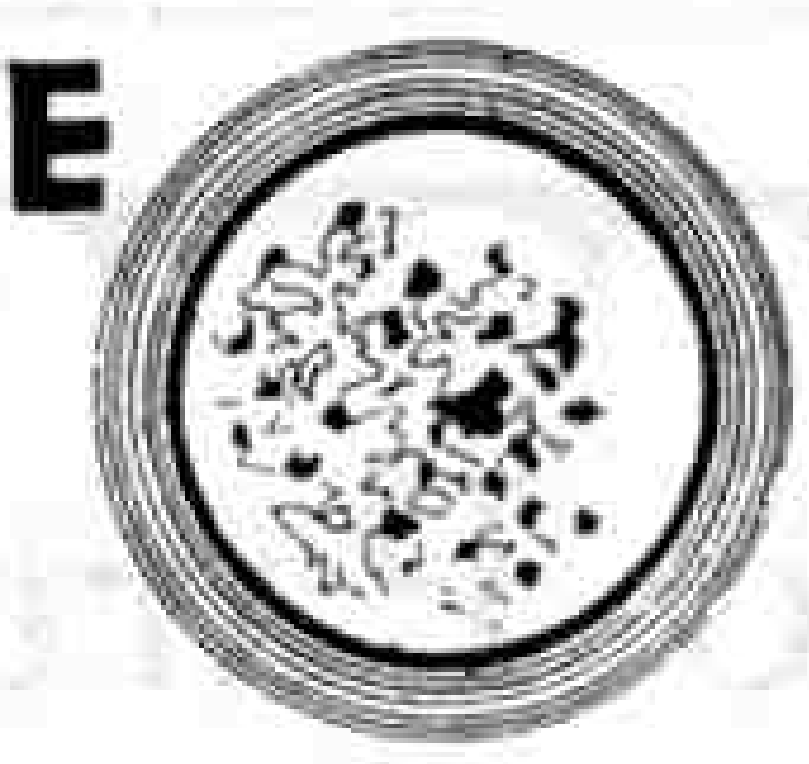

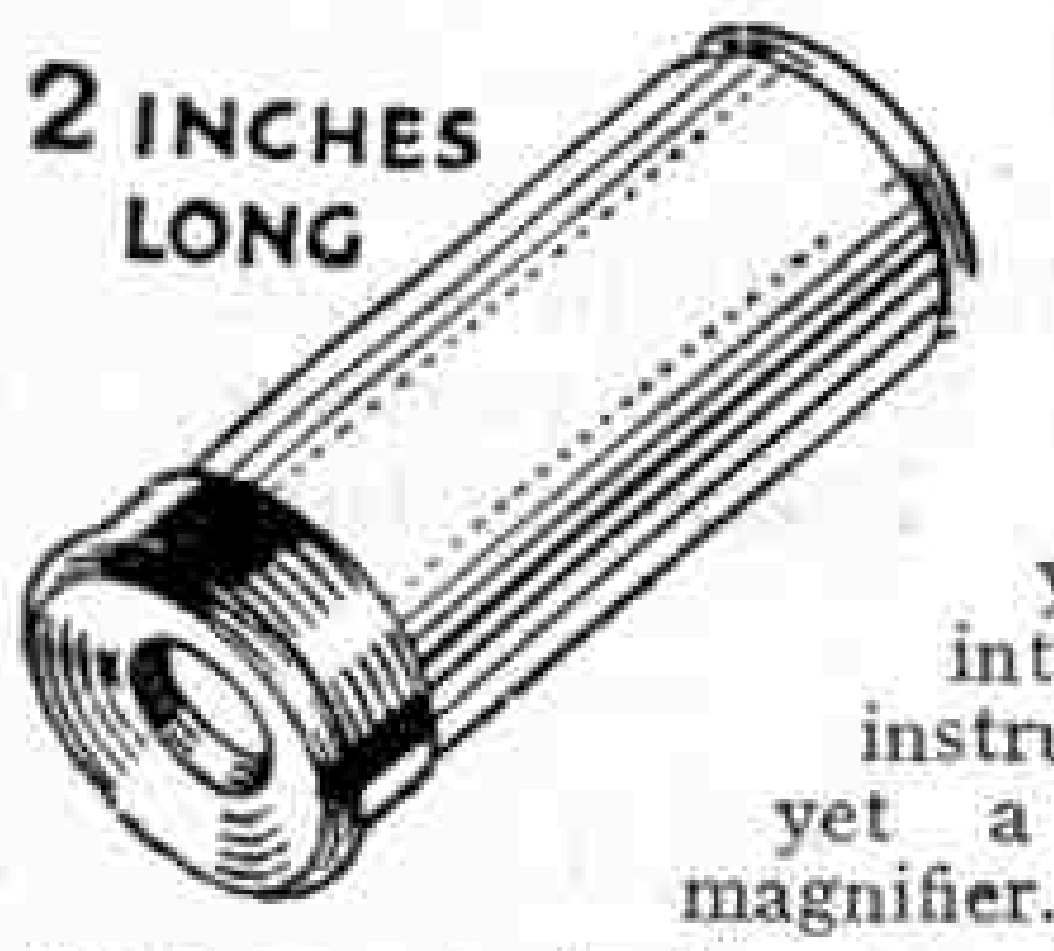

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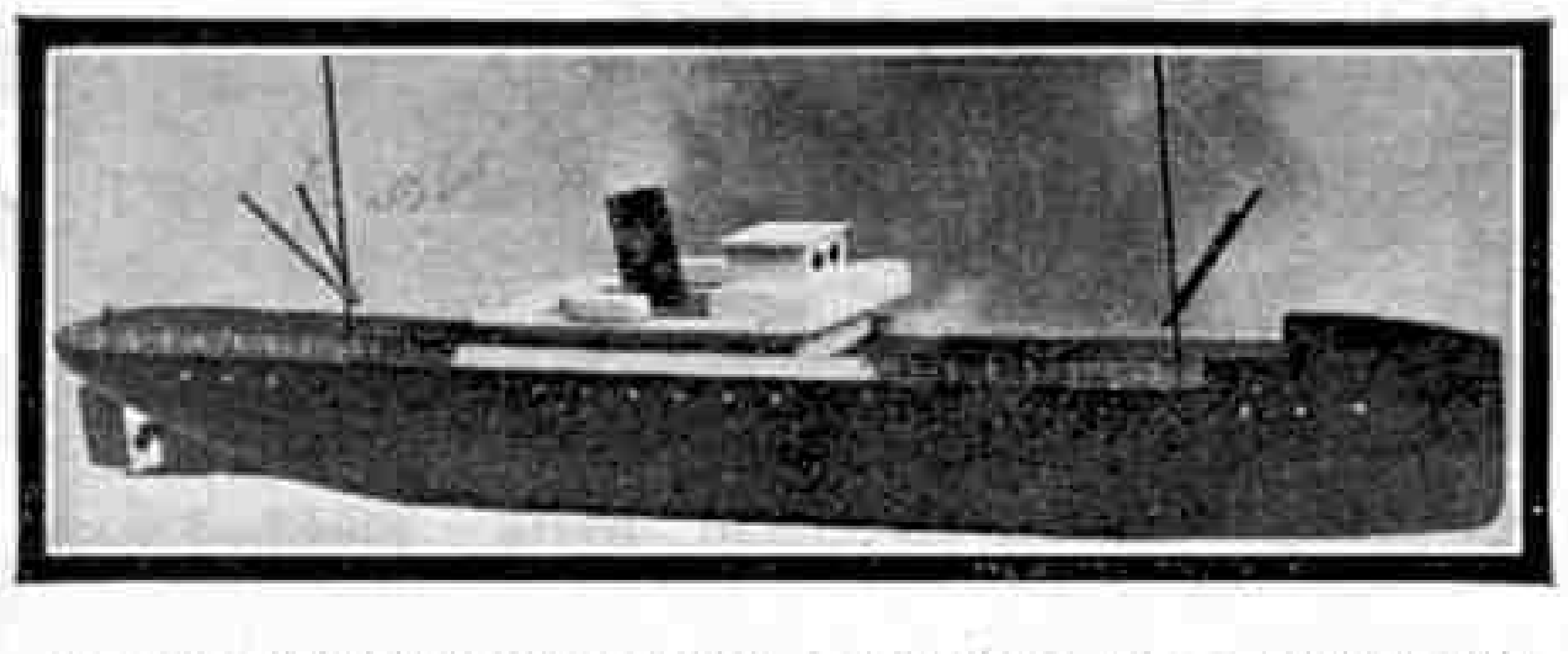

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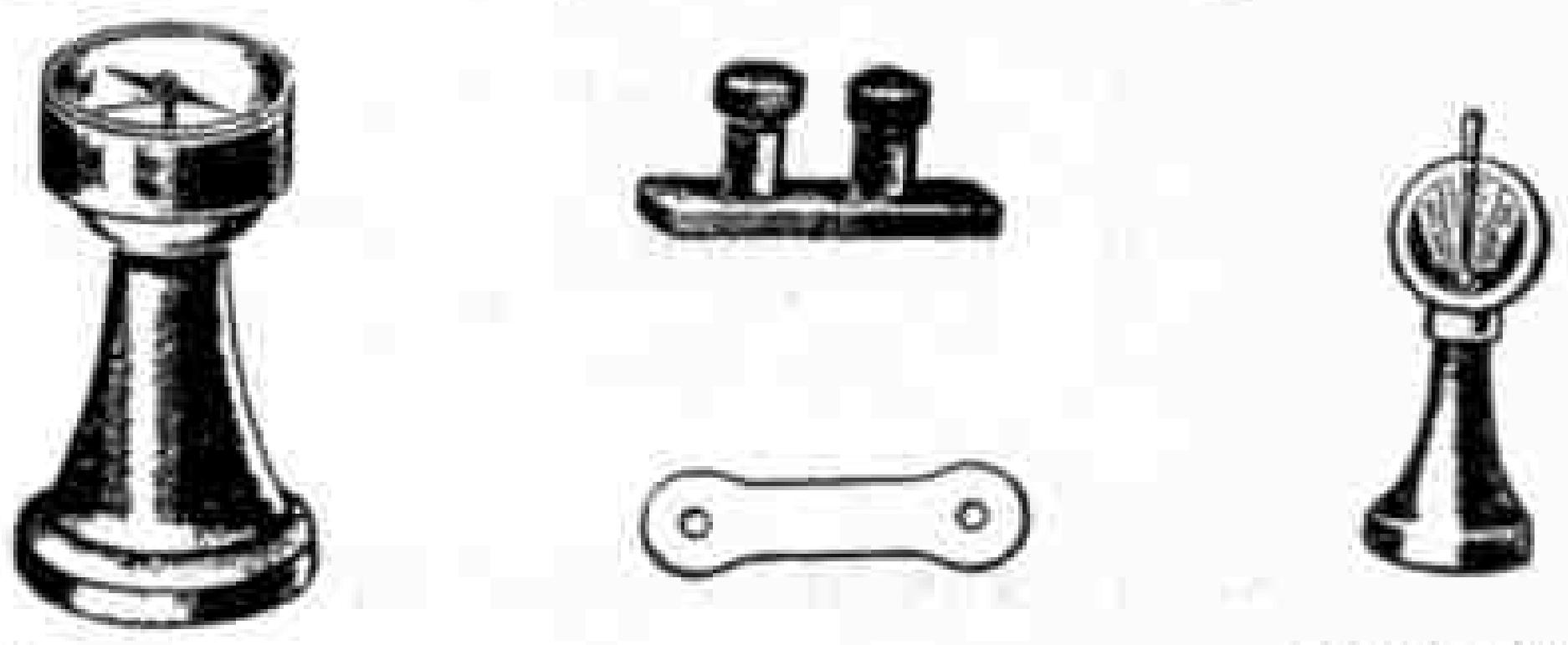

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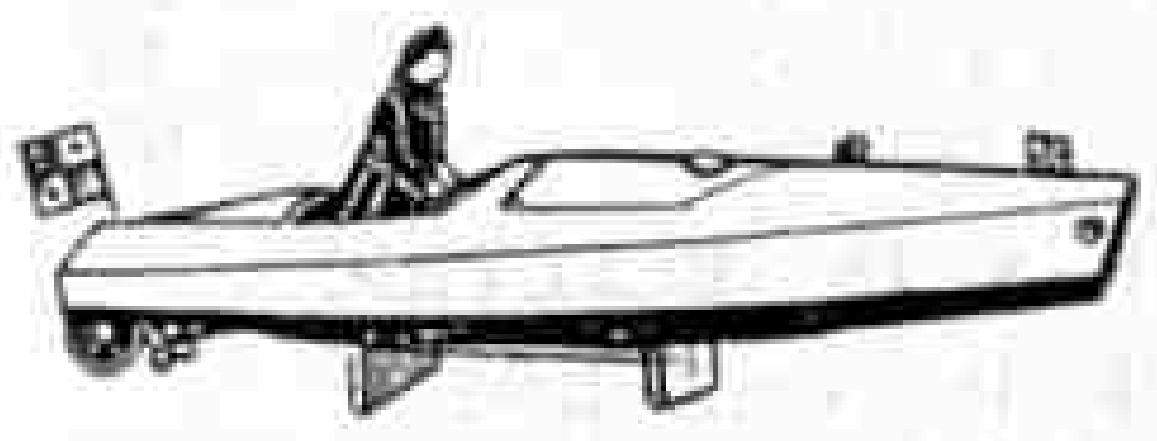

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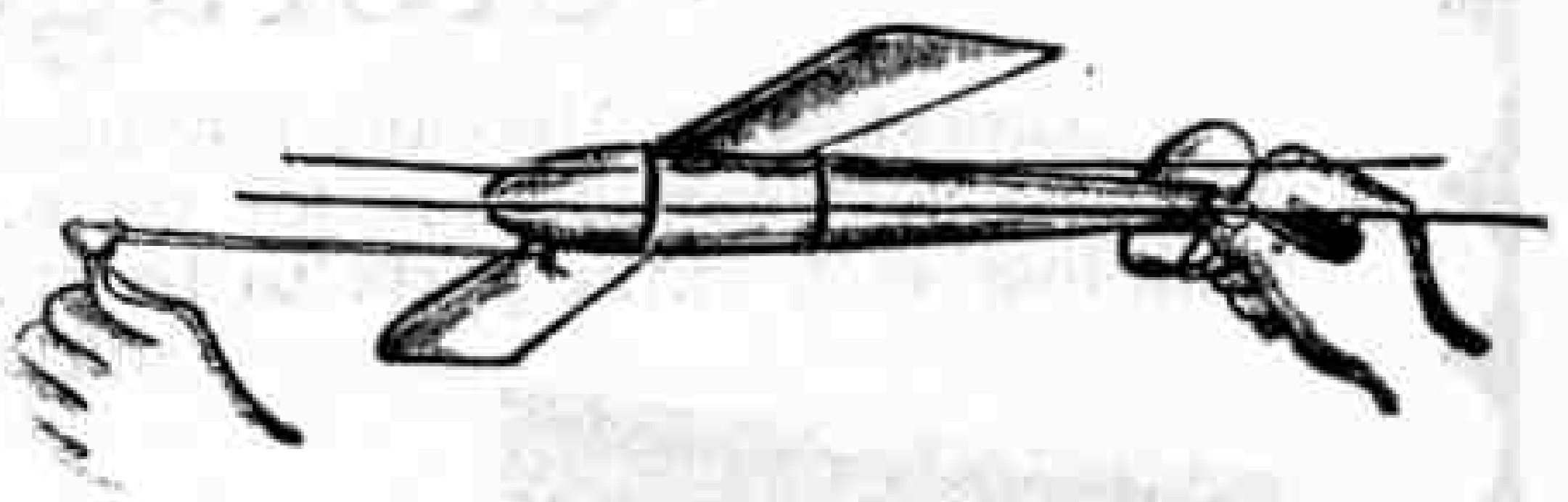

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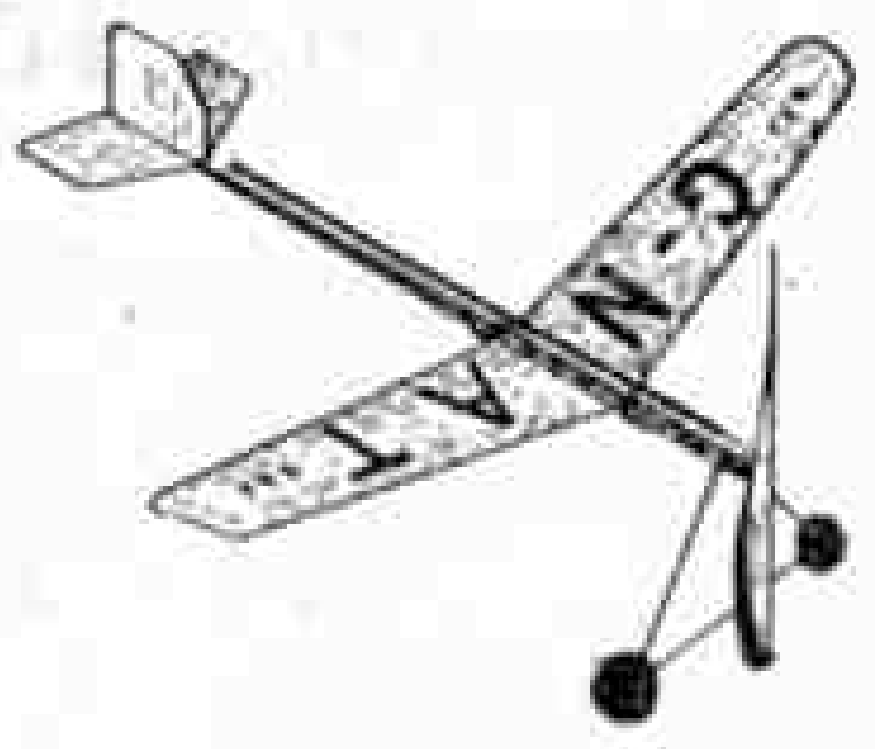

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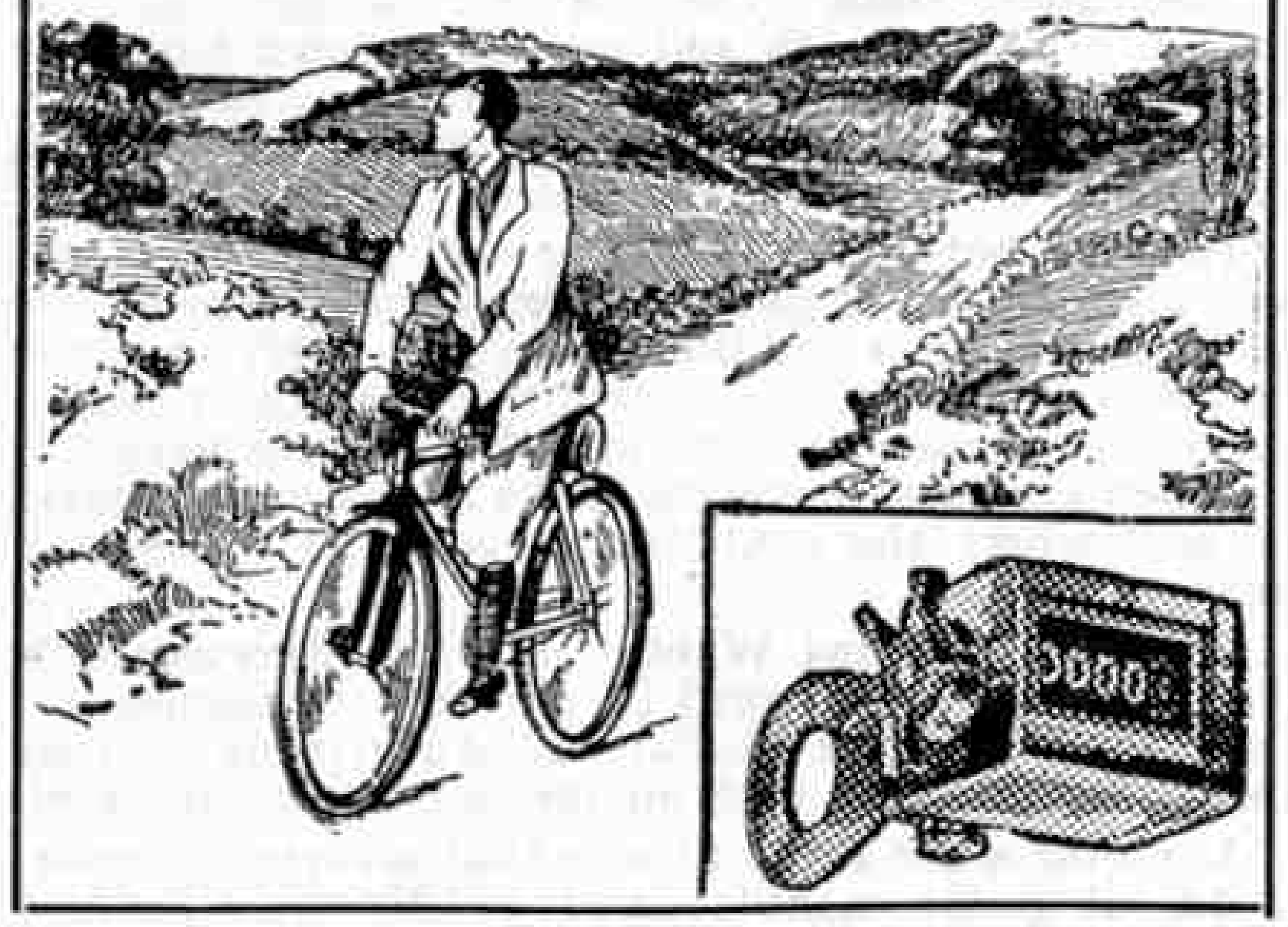

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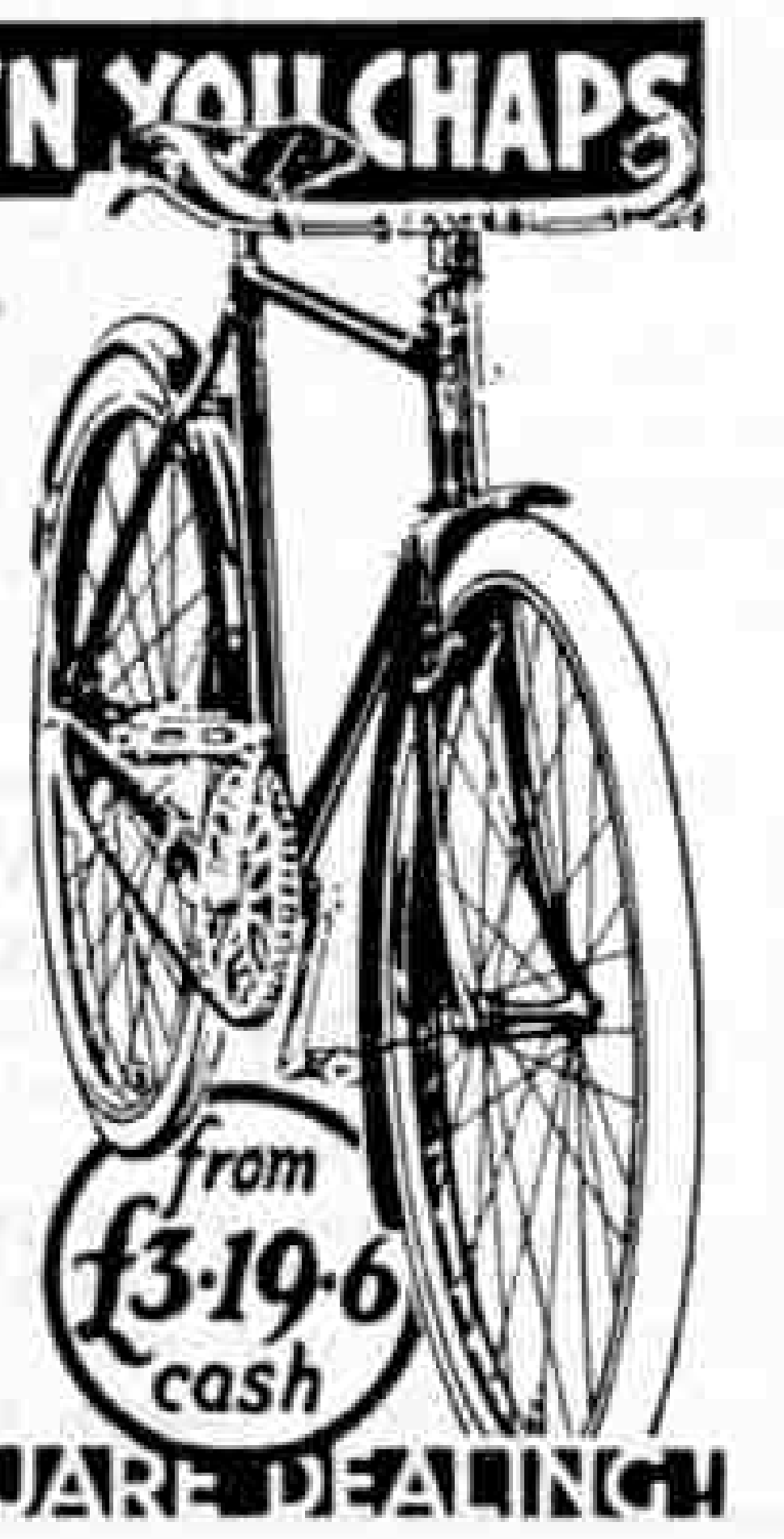

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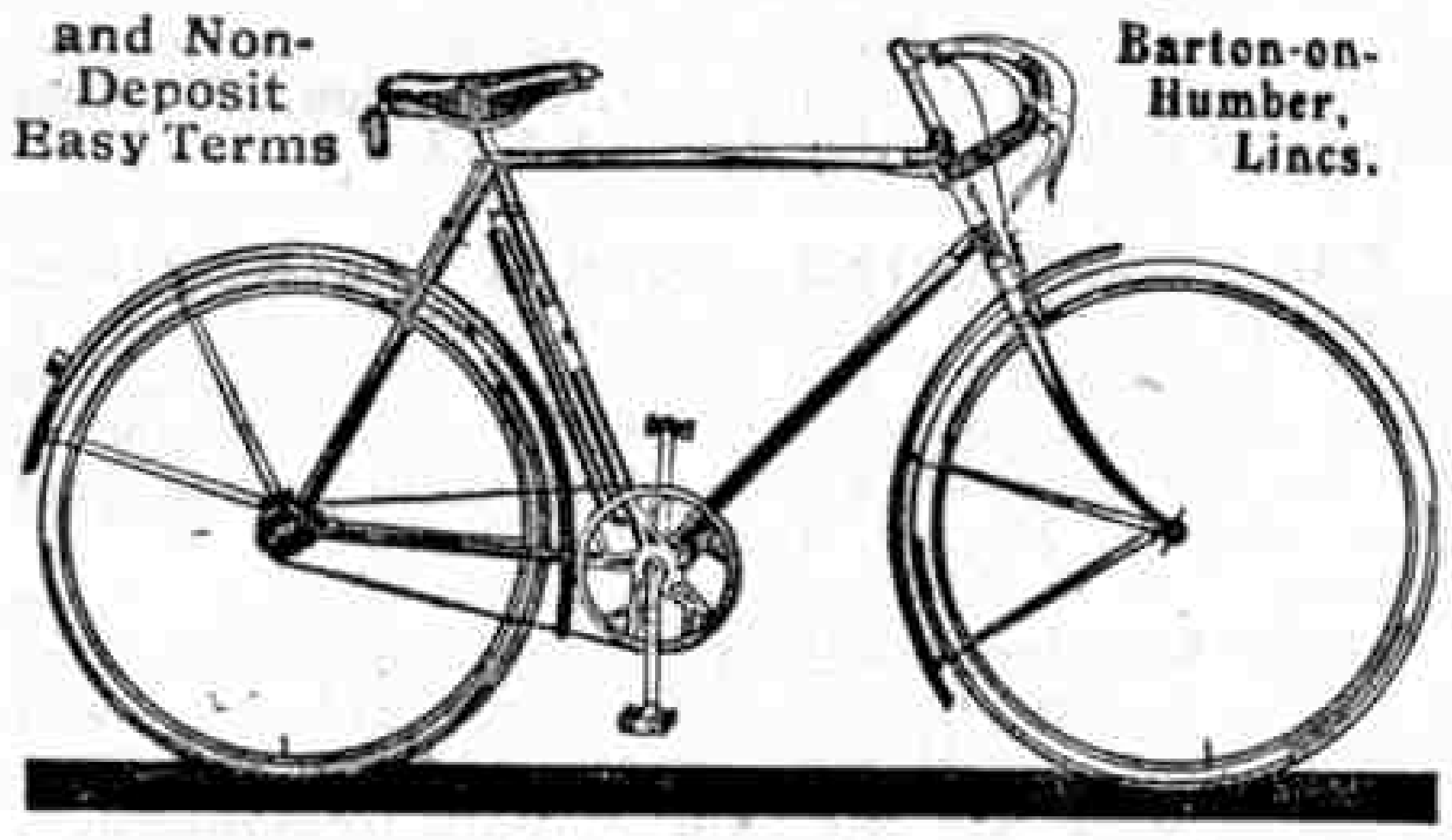

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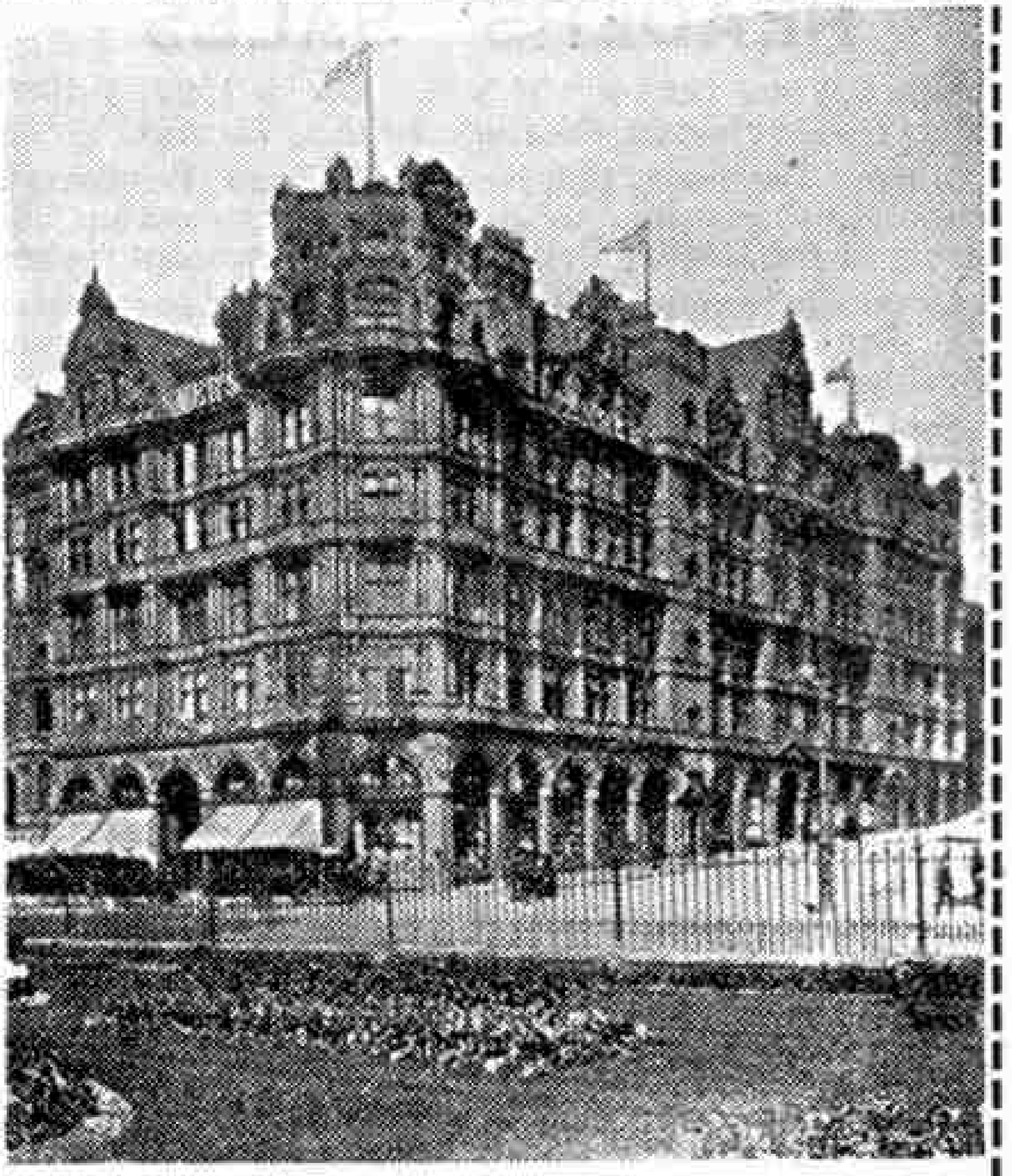

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(*Continued from page 279*)

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Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post free).

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Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

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UNITED STATES: Meccano Co. Inc., Elizabeth Av., Elizabeth, N.J. Meccano Co. Inc., 200, Fifth Avenue, New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

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* Outfits Nos. 5 and 6 are supplied in neat and well-made cardboard boxes (cartons) or in superior enamelled cabinets, with lock and key.

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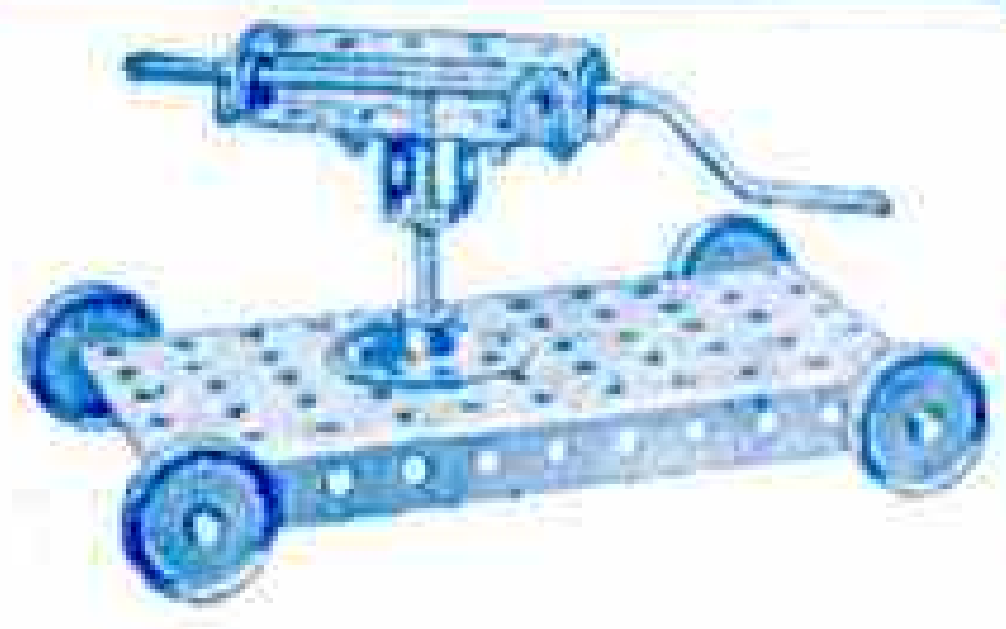
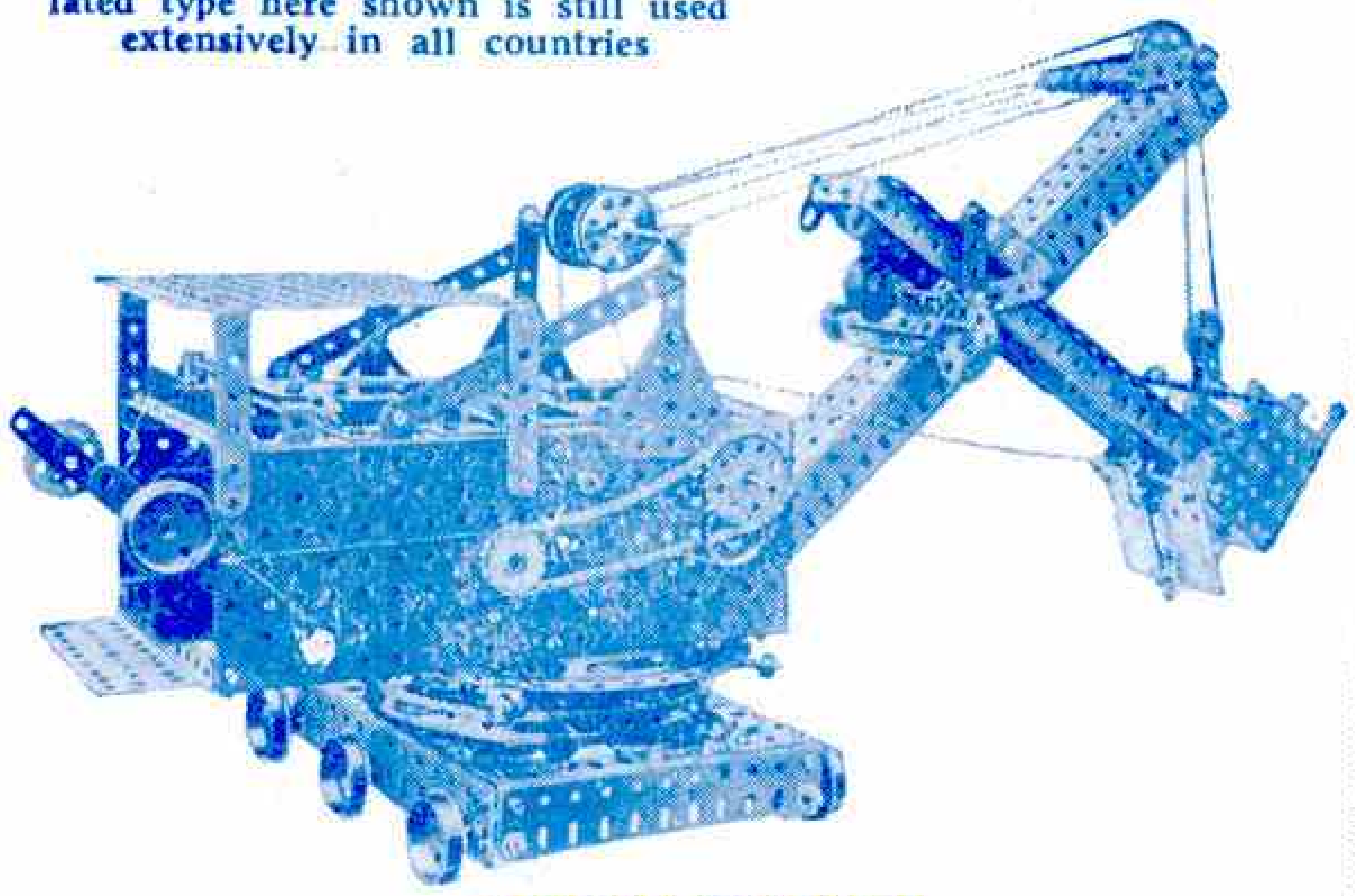


ROCK DRILL

This is a No. 0 Outfit model of a typical pneumatic rock drill, of the type used in mining and other work.

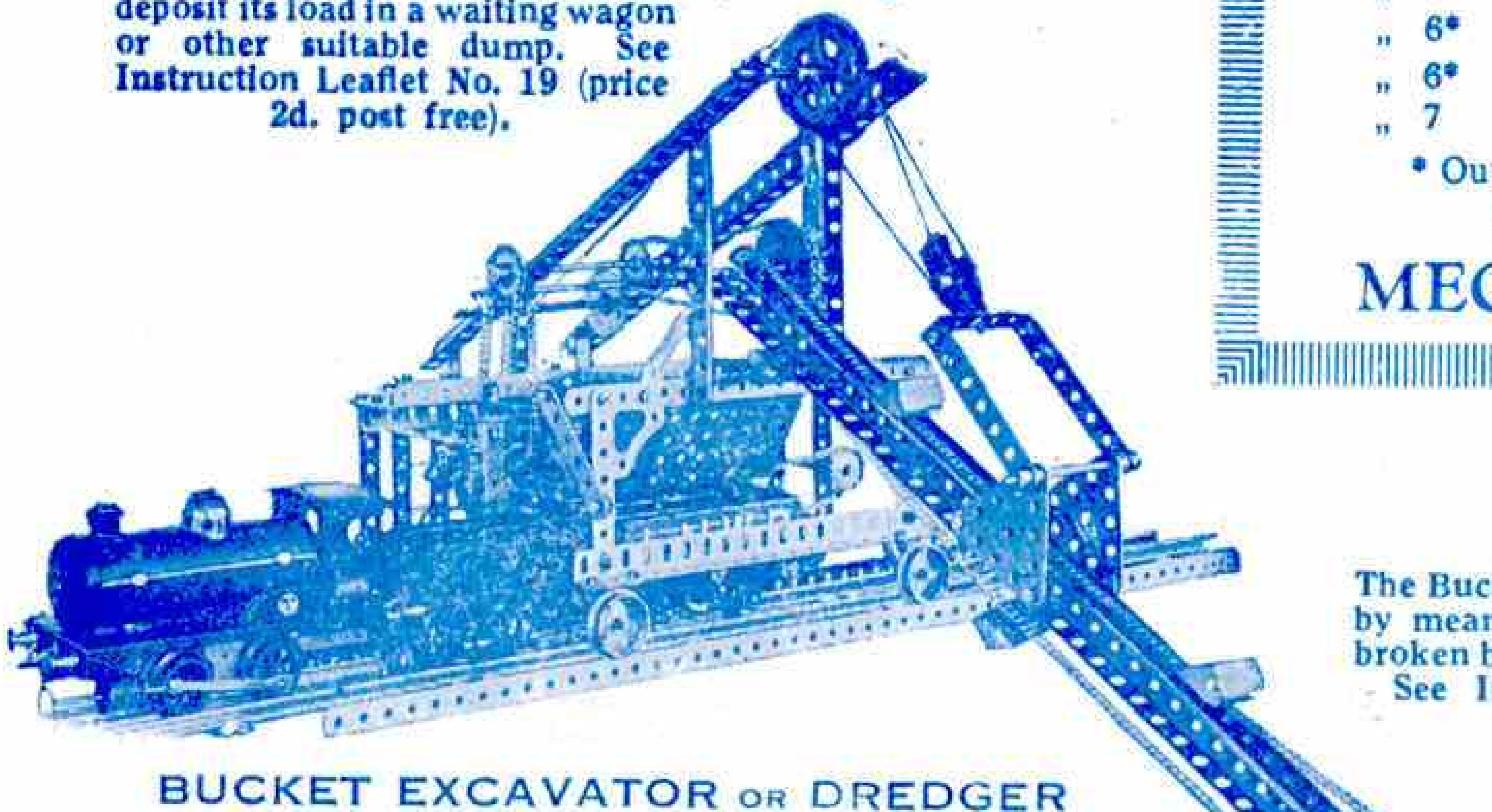
PLOUGH

The plough must be the most ancient form of earth-breaking machine known to man. The hand-manipulated type here shown is still used extensively in all countries



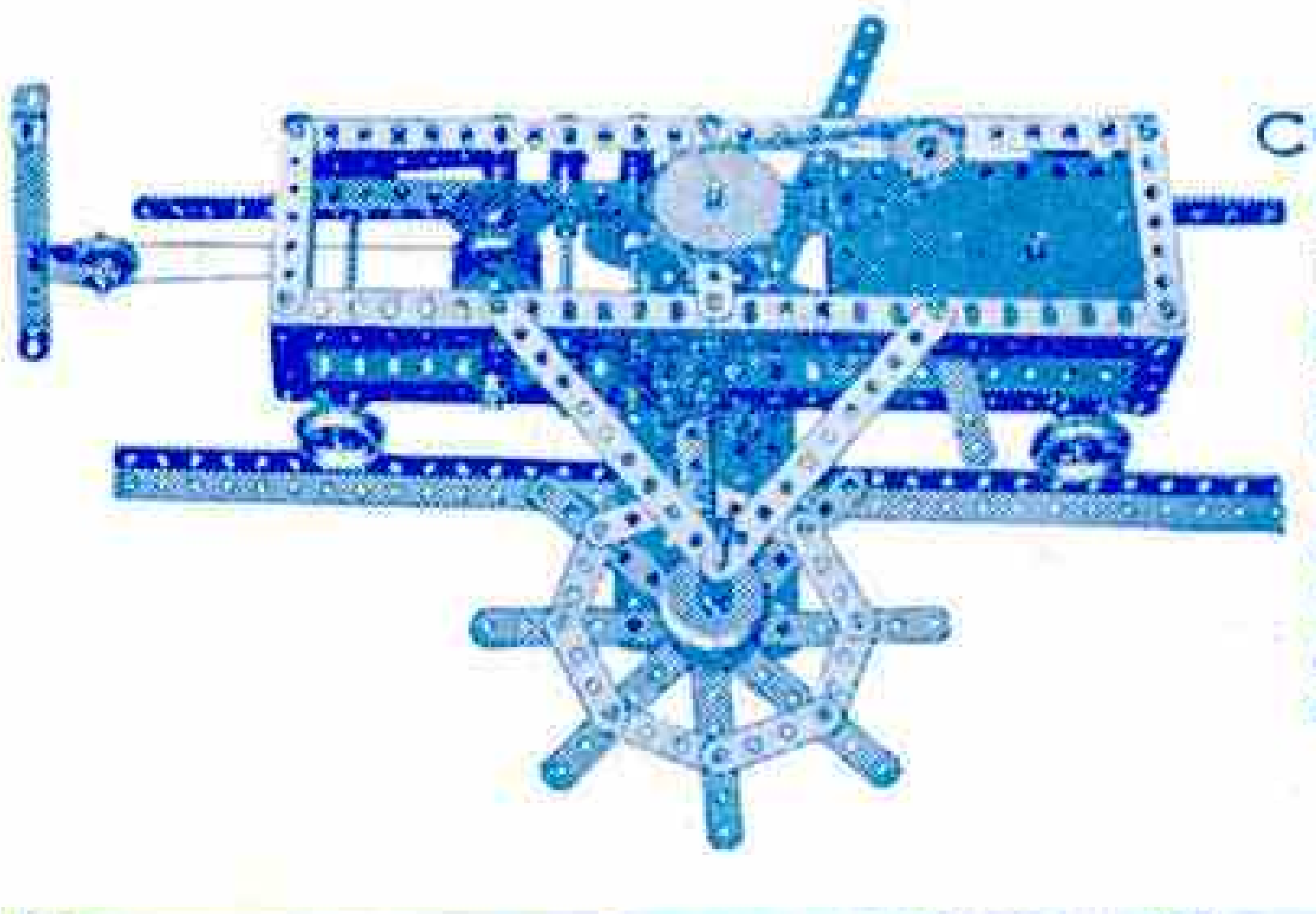
STEAM SHOVEL

The Steam Shovel is employed in the construction of canals, railway cuttings, etc. Each stroke of its arm scrapes several tons away from the sides of the cutting, so steadily increasing the size of the excavation, while, swinging round it can deposit its load in a waiting wagon or other suitable dump. See Instruction Leaflet No. 19 (price 2d. post free).



BUCKET EXCAVATOR OR DREDGER

This apparatus is suitable for handling soft or easily pliable material, such as mud (on river or harbour bottoms), grain, ashes, etc. The travelling buckets pick up the material and deliver it directly into waiting railway wagons. See Instruction Leaflet No. 5 (price 2d. post free).

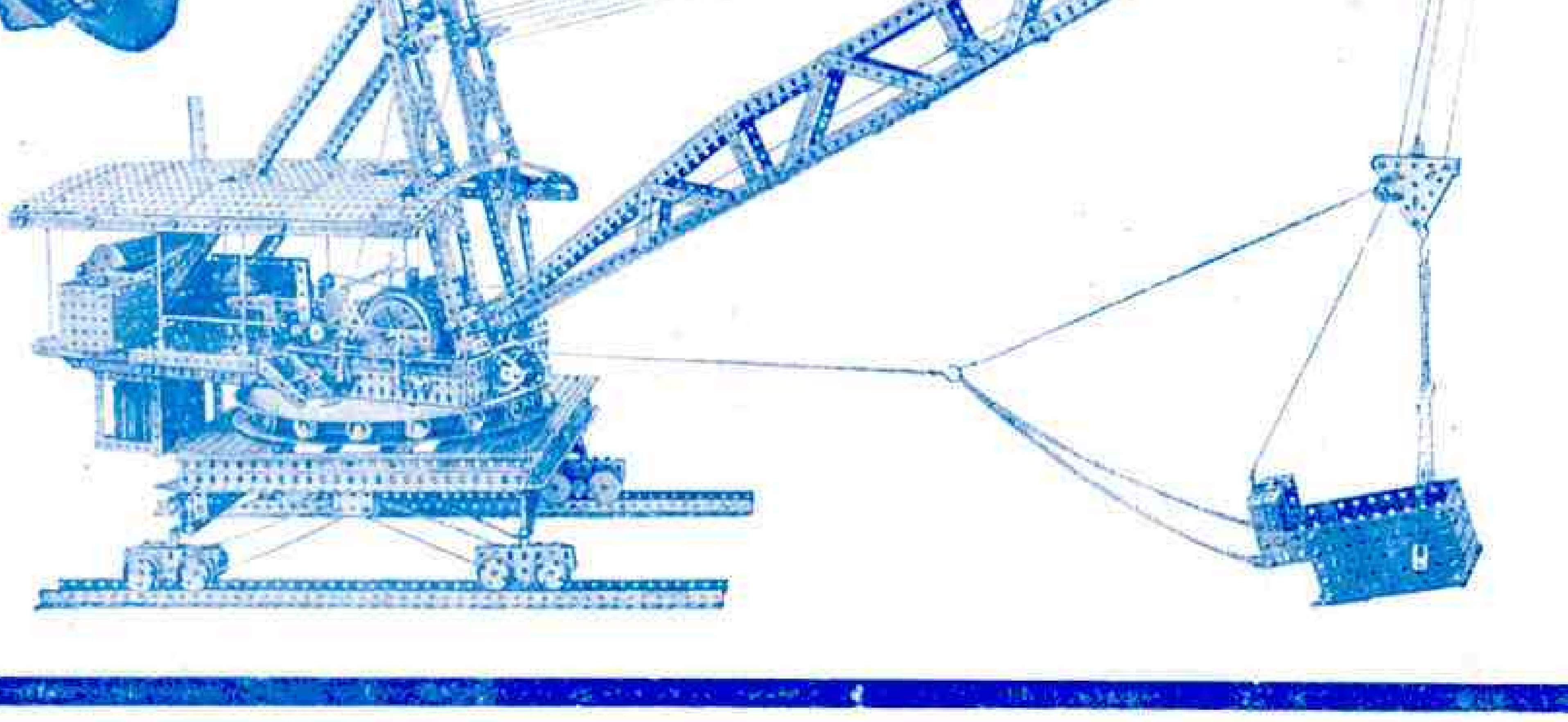


COAL CUTTER

This apparatus, by hauling on a rope, pulls itself along in a direction parallel to the coal-face, while its revolving cutters slice into the coal, which may afterwards be removed in large blocks.

DRAGLINE

The Bucket of a Dragline is pulled slowly towards the machine by means of a hawser. The material to be removed, being broken by its iron teeth, is forced into the mouth of the bucket. See Instruction Leaflet No. 27 (price 3d. post free).



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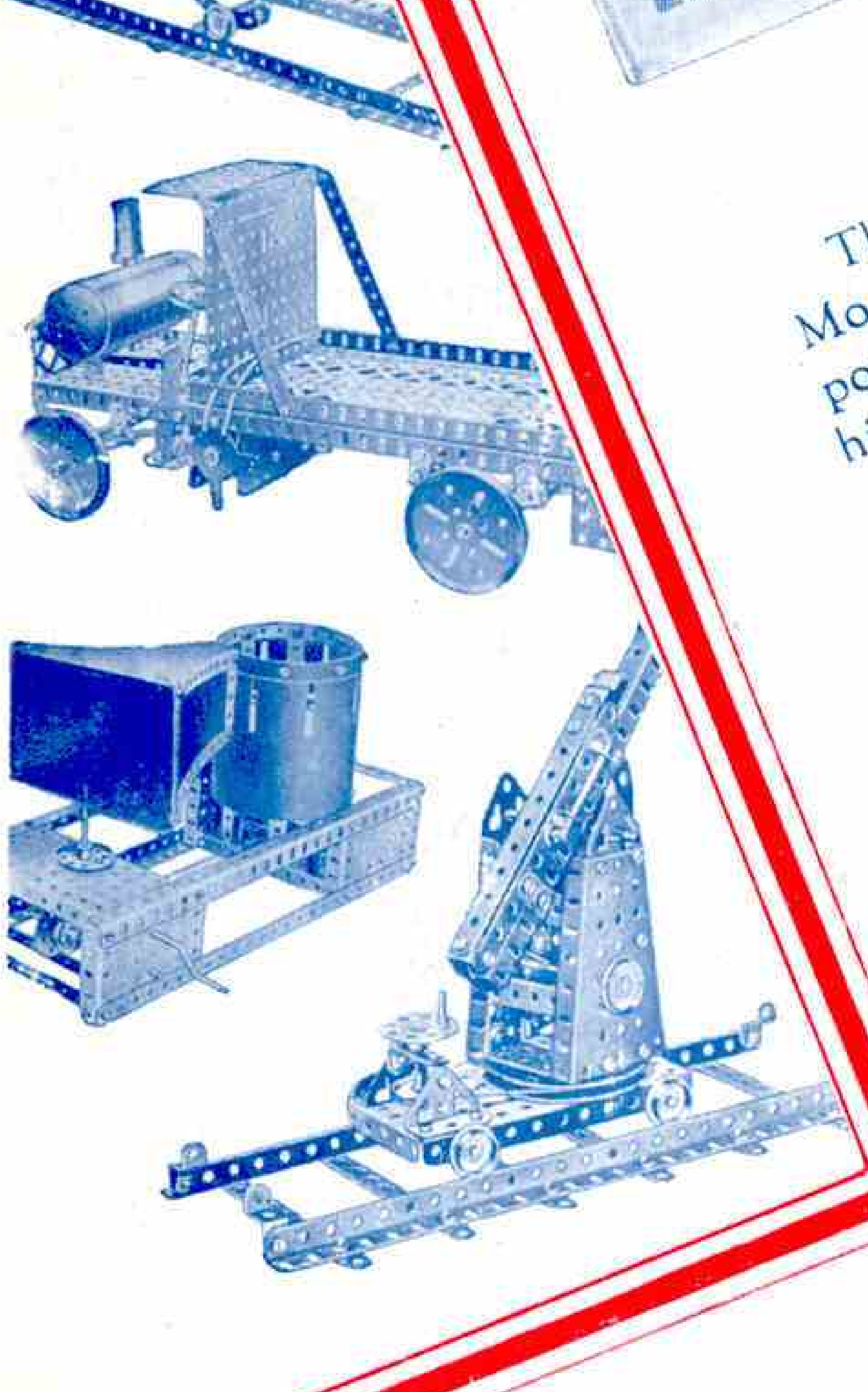

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